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Construction Methods

McGraw-Hill Publishing Company, Inc.

July, 1936

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In This Issue:

Heavy Structural Welding for Nine Buildings of Locomotive Works

Steel Frame House Built With Prefabricated Wall Panels

Concrete Pavement, 15 Years Old, Salvaged and Widened

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Germany's New Program of Super-Highway Construction

Plate Arch Culvert Tailored to Fit Meandering Brook

Heavy Construction (Part 8)
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Rapid Concreting and Form Handling on Long Viaduct

Commissary on Wheels

Pictorial News—Details—Oddities
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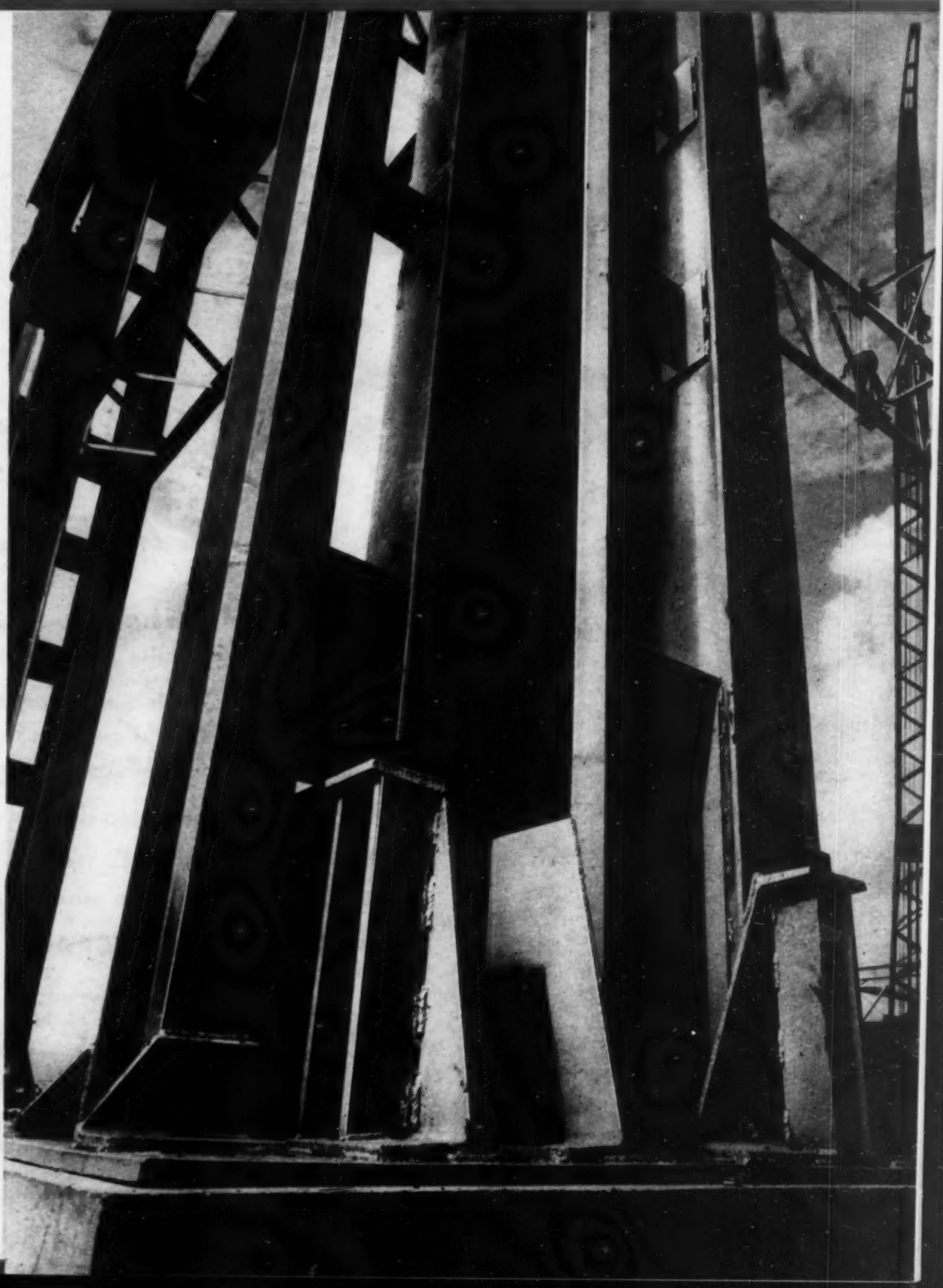

HEAVY ARC-WELDED COLUMN, one of fifty, erected to carry 200-ton electric traveling crane at new diesel locomotive works in La Grange, Ill.

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Construction Methods

McGraw-Hill Publishing Company, Inc.
330 West 42nd St., New York

ROBERT K. TOMLIN, Editor

JULY 1936

WILLARD CHEVALIER, Vice-President

Editorial Staff: Vincent B. Smith, John B. Huttl (San Francisco)
Leonard H. Church (Cleveland), Nelle Fitzgerald

Current Jobs

Buildings

Public — Contract awards for public buildings during the past month included a number of projects costing more than a million dollars. In front rank was the $4,657,300 for buildings for the U. S. Bureau of Engraving and Printing and the Department of Agriculture, in Washington, D. C., which went to **John McShain**, of Philadelphia. On the $1,500,000 Rotary Park federal housing project in Oklahoma City, Okla., **L. Sanders**, local builder, was the successful bidder. A building for the Home Owners Loan Corp., Washington, D. C., went to **James Stewart & Co., Inc.**, of New York City, for $1,446,700. Two PWA Housing Division projects were awarded, one, the Kenfield project in Buffalo, N. Y., which was obtained for $4,076,900 by **C. F. Haglin** and **Winston Bros.**, of Minneapolis, and the other, the Dixie Homes project in Memphis, Tenn., on which the **S & W Construction Co.**, of Memphis, bid $2,329,619.

Also in the million-dollar class were awards for the senior high school ($1,288,000) in Providence, R. I., to **James Bowden Co., Inc.**, of Boston, Mass.; the medical center unit ($1,256,300) in Jersey City, N. J., to **E. M. Johnson**, of Jersey City; and the nurses residence ($1,163,700) Welfare Island, N. Y. City, to **J. Weinstein & Rubin**, of Brooklyn, N. Y.

Other smaller lettings were $724,947 for high school in Ogden, Utah, to **G. A. Whitmeyer & Sons Co.**, of Ogden; $548,374 for soldiers memorial building in St. Louis, Mo., to **H. B. Deal & Co.**, of St. Louis; $518,000 for school in Union Springs, N. Y., to **E. L. Van Sickel & Co.**, of Bradford, Pa.; $517,953 for city hall at Montgomery, Ala., to **Algernon Blair**, of Montgomery; $515,000 for hospital in Orlando, Fla., to **Langston & Murphy, Inc.**, of Orlando; $511,000 for high school in Norwalk, Conn., to **John H. Eisele Co., Inc.**, of New York City.

Commercial — In the field of commercial buildings the largest contract was $3,500,000 for a 32-story office building in Rockefeller Center, N. Y. City, awarded to **Todd & Brown**, of N. Y. City. In Palm Springs, Calif., a $1,500,000 theatre, store and garage project went to **W. O. Warner**, of Los Angeles. A 17-story mercantile and banking building in Durham, N. C., was bid in for $900,000 by **George W. Kane**, of Roxboro, N. C. A $500,000 hotel in Ketchum, Idaho, is being built for the Union Pacific R.R. by **J. V. Neil Construction Co.**, of Los Angeles.

Industrial — Heading the list of industrial building awards was a $5,000,000 paper mill in Charleston, S. C. to **Morton C. Tuttle Co.**, of Boston. A $1,300,000 tin plate mill in Indiana Harbor, Ind., went to **United Engineering & Foundry Co.**, of Pittsburgh. In Cambridge, Mass., **Canter Construction Co.**, of Boston, received a $1,000,000 contract for a produce market structure. For a steam generating plant in Rochester, N. Y., the $1,000,000 bid of **A. W. Hopeman & Sons Co.**, of Rochester was successful.

Waterworks

In Colorado Springs, Colo., a 90-ft. dam went to **Ed. H. Honnen Construction Co.**, local contractor, for $386,789. A waterworks contract in Cicero, Ill., was awarded to **Leininger Construction Co.**, of Chicago, for $923,523. Denver, Colo., gave a $1,041,252 contract for Ralston Creek earth dam, to **United Construction Co.**, of Winona, Minn. A reservoir job in Allentown, Pa., was bid in by **M. A. Long & Co.**, of Allentown, for $979,499.

AND WHO'S DOING THEM

How—

. . . For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How . . . UNDERGROUND ROCK is located by timing sound waves with seismograph. — p. 25

How . . . HEAVY STRUCTURAL WELDING helped to complete 9 industrial buildings in 8 months. — p. 28

How . . . GOOSE-NECK CRANES erected steel for buildings of locomotive works. — p. 28

How . . . HEAVY GIRDERS to carry 200-ton service crane were raised into place. — p. 29

How . . . IMPROVISED DRYDOCK, using steel river barges, raised heavy dredge for repairs. — p. 30

How . . . CONCRETE PAVEMENT, 15 years old, was salvaged and widened. — p. 31

How . . . STRIKE-OFF TEMPLET was pulled by chains from paver to level off concrete below forms to receive reinforcing mesh. — p. 31

How . . . STEEL FRAME HOUSE was built with prefabricated, welded wall panels. — p. 32

How . . . BELT CONVEYORS and stackers were rigged to handle earth excavation from canal prism. — p. 35

How . . . CANAL EXCAVATION was removed by mobile transporter bridge carrying 12-yd. car. — p. 35

How . . . STEEL PANS on wood frames were loaded with earth and picked up by motor trucks. — p. 36

How . . . PAVING MIXER of German design placed concrete for super-highway construction. — p. 39

How . . . CORRUGATED PLATE CULVERT was "tailored" to fit course of meandering brook. — p. 40

How . . . JOINT between sidewalls and arch of culvert was made with asphalt-filled channel. — p. 40

How . . . BITUMINOUS PAVEMENT PATCHES were made with aid of well-equipped tank trailer. — p. 41

How . . . HEAVY RAM drove ½-ton pin to make cantilever bridge closure. — p. 42

How . . . HINGED SIDE of truck body facilitated loading and unloading. — p. 43

How . . . TRIPLE SPINNING WHEELS strung wires for 36½-in. suspension bridge cable. — p. 43

How . . . FRONT END CHARGING was applied to group of four big tilting mixers. — p. 43

How . . . SHAPED BASE made cofferdam crib fit uneven river bottom. — p. 46

How . . . CIRCULAR TEMPLET guided driving of sheetpiles for cellular cofferdam. — p. 48

How . . . CART RUNWAYS for delivering viaduct deck concrete were supported by short-legged wooden horses. — p. 50

How . . . HANGING SCAFFOLD and hook-bolt clamp helped stripping of viaduct deck forms. — p. 51

How . . . REFITTED PULLMAN CARS were made into mobile commissary train. — p. 52

Current Jobs

Highways

Mississippi has let some sizable highway contracts during the month, including $519,850 for 23.5 mi. to **Barber Bros. Co.**, Baton Rouge, La.; $317,378 for 14.1 mi. to **Cornell-Young Co.**, of Macon, Ga.; $578,311 for 23.3 mi. to **Carey-Reid Co.**, of Lexington, Ky. In Connecticut awards were made to **A. I. Savin Construction Co.**, of East Hartford, for $360,453 and to **Osborne-Barnes Co.**, of Danbury, for $598,109 for grading on the Merritt Parkway. Illinois contracts were received by **J. Mackler Co.**, of Chicago Heights, for $296,025; and by **Chicago Heights Coal Co.**, for $374,360. In California, **W. Von der Hellen**, Medford, Ore., was given a $369,376 contract for grading in Yosemite National Forest; **Hanrahan Co.**, San Francisco, bid in a $229,512 job.

For extending Grand Central Parkway in Queens County, N. Y., awards were made to **Johnson, Drake & Piper, Inc.**, of Freeport, N. Y., for $924,190. In Nassau County, the **Good Roads Engineering & Construction Co.**, was successful bidder at $516,297, for a portion of Bethpage Parkway. For 7.2 mi. of highway in Lincoln County, New Mexico, **Armstrong & Armstrong**, of Roswell, were low bidders at $224,919. North Carolina awards were made to **Ballenger Paving Co.**, of Greenville, S. C., for 10.7 mi. of concrete paving at $312,162. **J. Miller Eshelman** was given a $233,834 contract in Pennsylvania. For grading and paving in Missouri, **List Construction Co.**, of St. Louis, received two contracts totaling $278,414.

Bridges

Bridge and grade-crossing elimination projects were awarded as follows: In New York $344,054 to **Quinn-Messner Co.**, of Corona, N. Y., and $388,944 to **Walsh Construction Co.**, of Syracuse, N. Y. In Vermont, $373,000 to **P. Caputo Construction Co.**, of Brighton, Mass. In Pennsylvania, $227,080 to **McCrady Construction Co.**, of Pittsburgh. In New York, $342,340 to **J. Leopold & Co.**, of New York, for approaches to Triborough Bridge. In Texas, $307,532 to **Brown & Root**, of Austin, Tex.

Project Progress Notes

Federal Aid for Highways — A total appropriation of $476,000,000 for federal-aid highway construction for the fiscal years of 1938 and 1939 is carried by the Hayden-Cartwright act, passed by Congress and approved by the President June 16. In matching federal funds the states will contribute an additional $300,000,000, thus increasing the federal-aid highway program for the fiscal years 1938 and 1939 to a total of $776,000,000.

Grand Coulee Dam — Construction of Grand Coulee dam on the Columbia River in Washington by **Mason-Walsh-Atkinson-Kier Co.**, is 6 months ahead of schedule, according to a recent report by John C. Page, acting commissioner, U. S. Bureau of Reclamation. The contract is 51 per cent complete while only 37 per cent of the allotted time has been consumed. Up to June 6 a total of 18,853,000 cu. yd. of earth and rock had been excavated at the dam site and 516,000 cu. yd. of concrete had been poured since Dec. 6.

Fort Peck Dam — At Fort Peck dam on the Missouri River in Montana, world's largest earth-fill barrier, the four electric dredges of the U. S. Army Engineer Department deposited 3,734,000 cu. yd. of fill in the dam during May, exceeding the previous record by 100,000 cu. yd. On June 1 a total of 27,466,900 cu. yd. of hydraulic fill had been placed.

AND WHO'S DOING THEM

The I *is Obsolete*

STANDING on the bank overlooking any one of those imposing construction enterprises such as Boulder Dam, Bonneville, Grand Coulee, the San Francisco Bridges or the Colorado River Aqueduct, one becomes impressively aware of the cooperative effort that is essential to modern construction practice.

The building of such works cannot be a one-man job. In the chronicles of such enterprise is no place for the vertical pronoun. No one ever can say with reason, "that structure *I* built." To attempt it were but to invite ridicule, for the very work itself shrieks denial. No administrator, no engineer, no contractor can arrogate to himself on so vast a creation the rôle of creator.

Design itself must be a cooperative effort. Specialists in many fields of science and technology must be assembled and contribute the best of their learning and analytical powers. Hundreds of engineers, each entrusted with some structure or even some detail of a structure, must pour into it alone the mental sweat of months or years. To be sure, there must be a coordinating head to tie into a coherent and balanced whole the efforts of all and to assume ultimate responsibility for the work of all. But no finite mind can hope to encompass the infinite ramifications of so infinite a variety of problems; as never before the chief must trust his associates. He may adopt their work as his own, but it still is *their* work.

LIKEWISE with construction. Engineers may devise tentative schemes whereby to translate their plans into reality but some contractor must take unto himself the responsibility and the risks of devising ways and means actually to do it. But he in turn must call upon others. Each subdivision of the whole he entrusts to a man especially qualified by aptitude or experience; on his understanding, resourcefulness and energy he must rely for the results that spell success and profit or failure and loss.

When it comes to the methods and plant required on certain operations, still another figure enters. Manufacturers of materials and equipment are called in or seek an opportunity to contribute their specialized knowledge or experience. The fruits of their research and engineering staffs are made available in the form of materials of special fitness or of equipment equal to unprecedented burdens or efficiencies. Indeed, the whole plan of attack on such projects may hinge on some special equipment, designed by a manufacturer either on his own initiative to create a market for his products or to meet the specifications of some engineer or contractor who seeks to apply in practice some new method he has evolved.

The more enormous our undertakings, the more complicated our problems, the more comprehensive our aggregate sum of knowledge and the more specialized our individual skills, the more we must disperse actual performance among many expert workers. However we may concentrate responsibility for performance, performance itself we must delegate. The march of technical progress has rendered obsolete the vertical pronoun.

WHAT IS SO notably true of these unprecedented undertakings is true in some degree of all construction. No longer does the one master-mind design, superintend and dictate every detail of the construction process as did the early engineers; no longer is the contractor a masterful driver of men and animals and the one fertile source of every scheme and device required by his job. Each has become but a coordinator of the efforts of others, many of whom may have forgotten more of their specialities than their chiefs ever will know; each relies upon consultants, manufacturers and special advisors for the counsel and help he needs to do his job.

The successful construction executive of today, whether engineer or contractor, recognizes that his has become a coordinating function. He can't know it all, he can't plan it all, he can't do it all; he must rely on others for the knowing and the thinking as well as the doing. Those others he must select wisely and trust discreetly; to them he must accord full credit for their creative rôles.

In short, in successful modern construction, the *I* is obsolete.

Willard Chevalier

CONSTRUCTION METHODS. July, 1936. Volume 18, Number 7. Published Monthly, price 20¢ a copy. Subscription rates—United States, Canada, Mexico, and Central and South American countries, $2.00 a year. All other countries, $4.00 a year or 16 shillings. Entered as second class matter October, 1926, at Post Office at New York, N. Y., under the act of March 3rd, 1879. Printed in U.S.A. Cable address "McGrawhill, New York." Member of A.B.P. Member of A.B.C. Contents Copyrighted 1936 by McGraw-Hill Publishing Co. Inc., 330 West 42nd Street, New York. N. Y.

McGRAW-HILL PUBLISHING COMPANY, INC., 330 WEST 42d STREET, NEW YORK, N. Y.

Editorial and Publishing Offices: 330 West 42d St., New York; 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, London, W. C. 2, England. Branch Offices: Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

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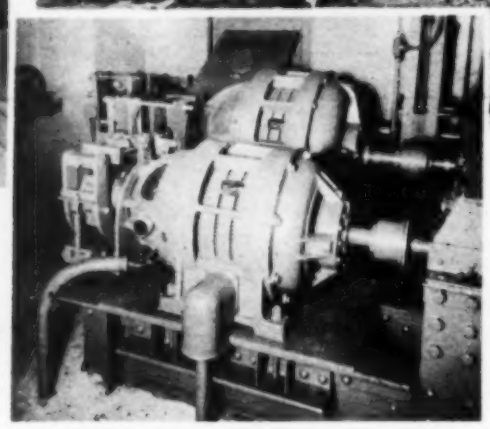

Above: center span, more than 2100 tons, raised 130 feet in two minutes and kept level by G-E equipment. Middle: G-E motors and Thrustor-operated brakes on one of the towers. Left: clear indication and easy control at all times of bridge position by means of G-E equipment in control room.

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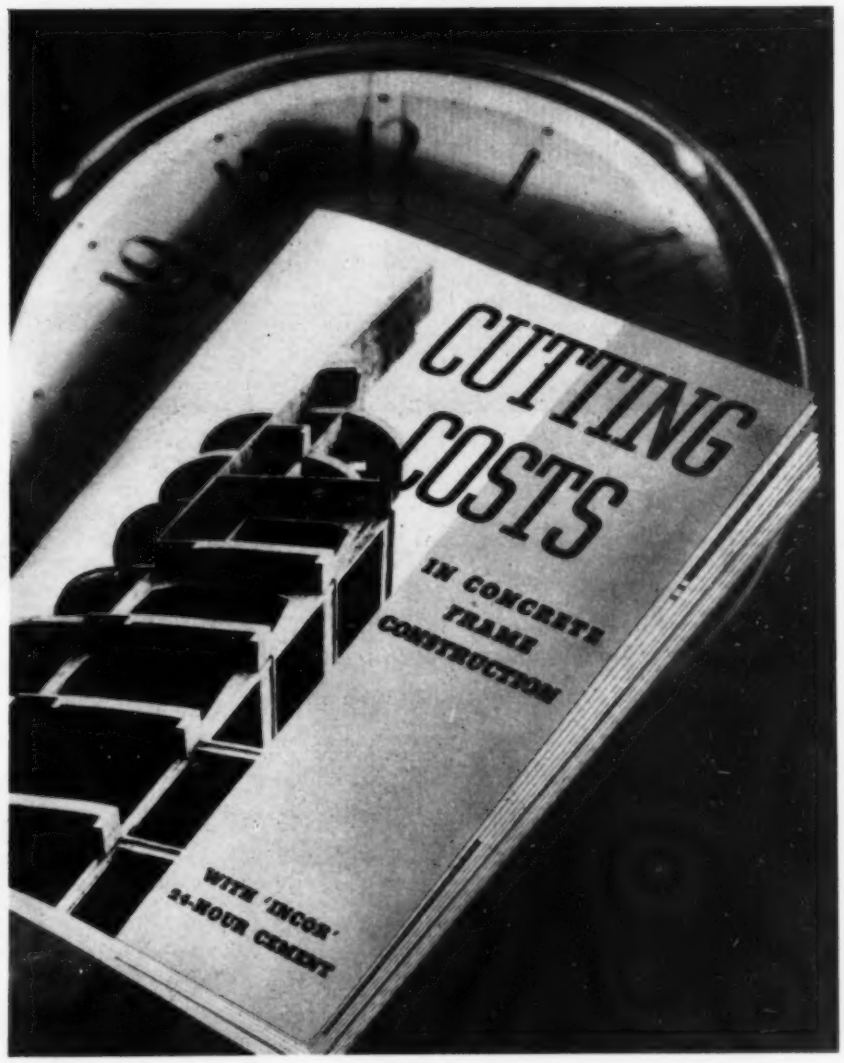
NON-PRODUCTIVE

Time

WHAT IT MEANS—AND HOW TO SAVE IT



"PROFIT usually hinges on savings realized through good job organization," says a well-known engineer and builder. True enough. But isn't it often a case of saving at the spigot—by centering attention on direct costs for labor and materials; only to let profits run out of the bung-hole—through needlessly heavy overhead?

Take the problem of non-productive time—that is, the time required for concrete to become self-supporting—"dead" days when frame-erection stands still, while fixed overhead expense piles up.

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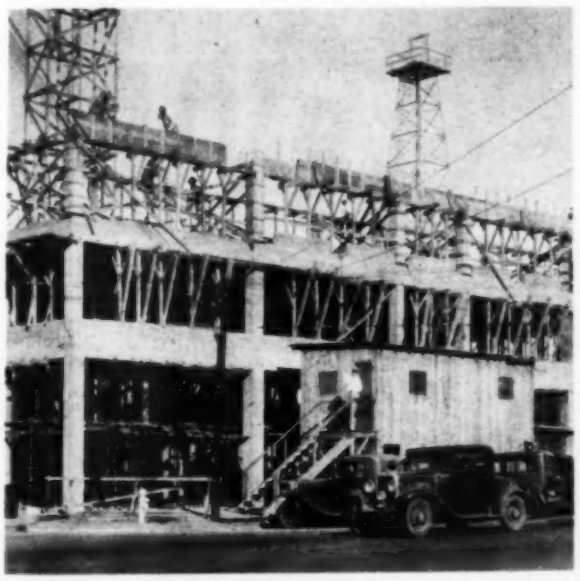
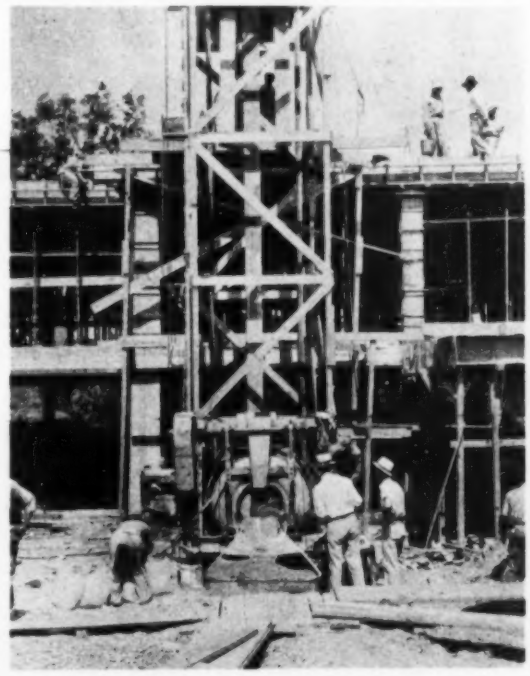


2-TO-1 SAVING: *Using 'Incor' for 3rd, 4th and 5th floor slabs on Kilgore, Texas, Hotel (left), contractor completed a floor every 4 working days. He saved $465 on form material and labor; brick work started 10 days sooner, saving $200 more on overhead, at $20 a day. Total saving, $665. Extra cost of 'Incor,' $200. Net saving, $465.*

• • •

By comparing 'Incor' and ordinary cement erection schedules, contractor found that 'Incor' saved 10 working days on City Hospital, Tyler, Texas (right). Overhead costs were $25 a day, low for this type of work; 10 days saved meant $250. He also saved $400 on forms. Total saving—$650. Extra cost of 'Incor'—$308.75. Net saving—$341.25.



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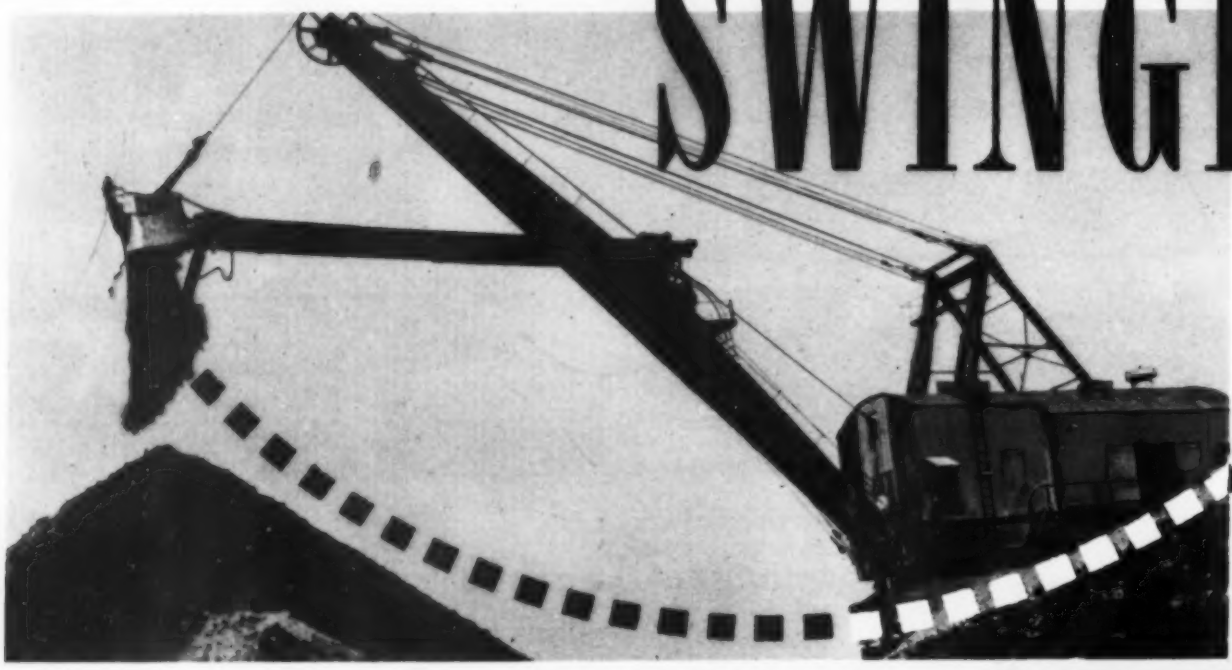

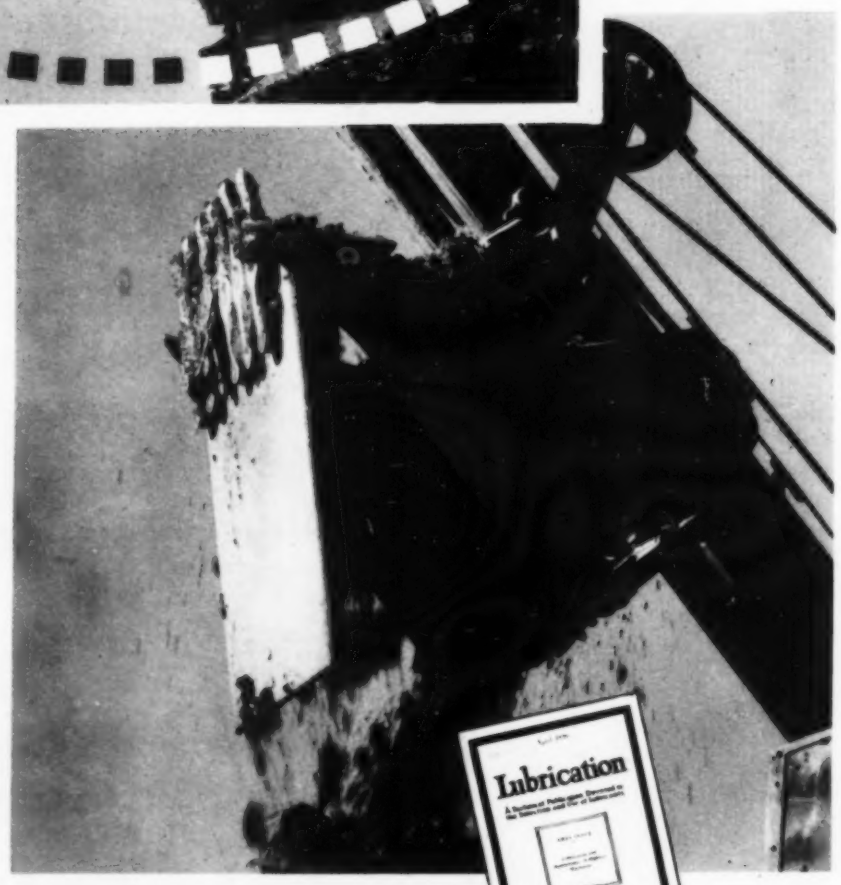

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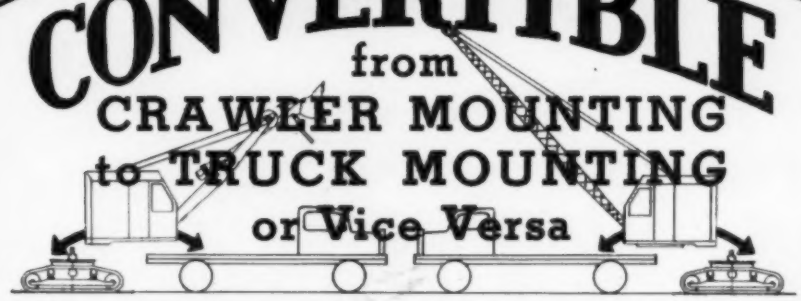

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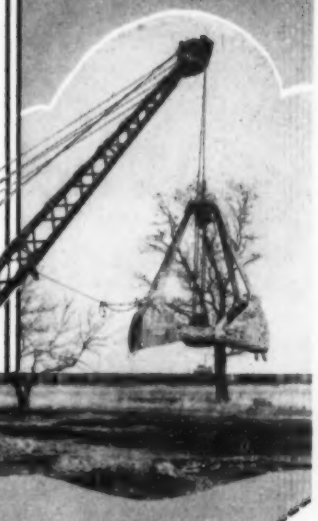

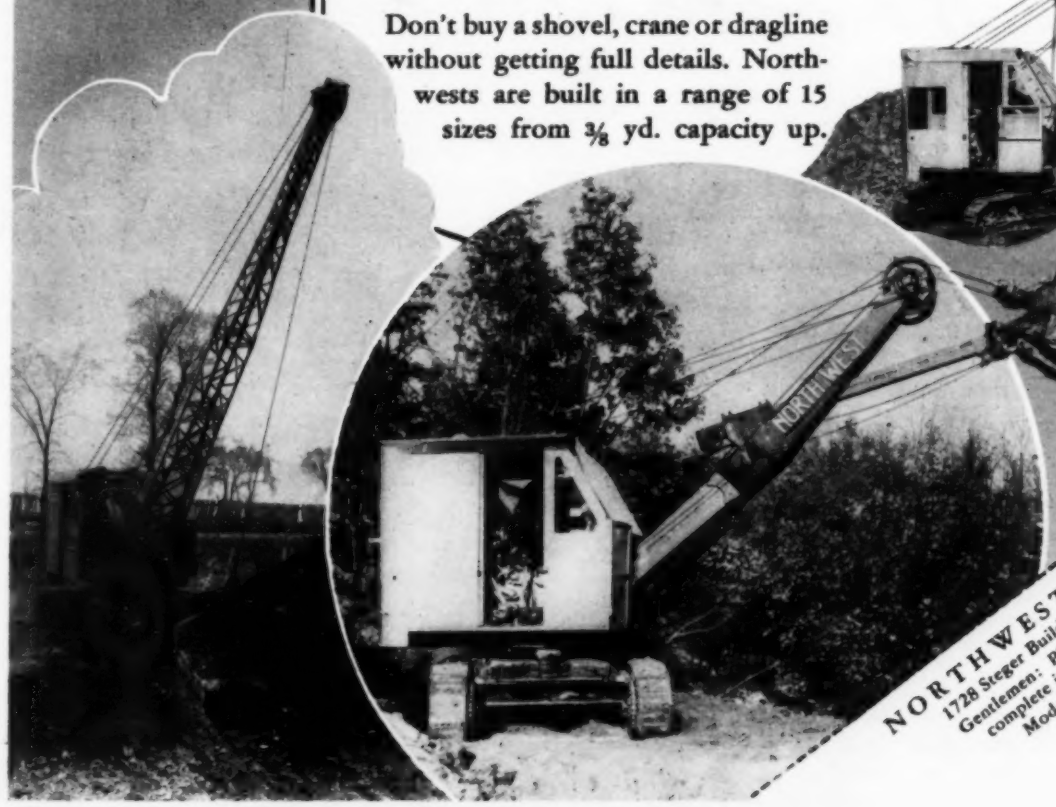

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Gentlemen: Please, without obligation on my part, furnish me with complete information on the models checked.
Model 15—⅜ yd. capacity ☐ Model 18—½ yd. capacity ☐
Shovel ☐ Crane ☐ Dragline ☐

Name _____
Address _____
Town _____ *State* _____

California Fruit Growers Exchange, Los Angeles. Architects, Walker & Eisen. Chief Engineer, F. R. Winch. Consulting Engineer, Prof. R. R. Martell, California Institute of Technology. Contractor, Wm. Simpson Construction Co.

Who's Getting the Contracts for these ARCHITECTURAL CONCRETE Buildings?

Many important new buildings are going "architectural concrete" these days — walls and ornamental detail cast in the forms right along with frame and floors — specifically *designed* to be built by this money-saving method.

Architectural concrete offers the practical advantages needed in buildings. And the men who are important factors in buying buildings know of these advantages.

When concrete is specified for important schools, churches, commercial structures and factories in your territory, will you be prepared to bid?

Facts on latest methods are available in free Information Sheets and booklet *Forms for Architectural Concrete,* covering problems of equipment, layout, procedure, construction details and selection of materials.

Architectural Concrete

Frame and floors cast integral with walls and ornamental detail . . . Weather-resistant . . . Firesafe . . . Distinctive . . . Economical.

PORTLAND CEMENT ASSOCIATION
Dept. A7-16, 33 W. Grand Ave., Chicago, Ill.

Please send literature checked:

☐ *Forms for Architectural Concrete*

☐ Information Sheets on specifications and other details (AC series, 1 to 12)

Name .....

Company .....

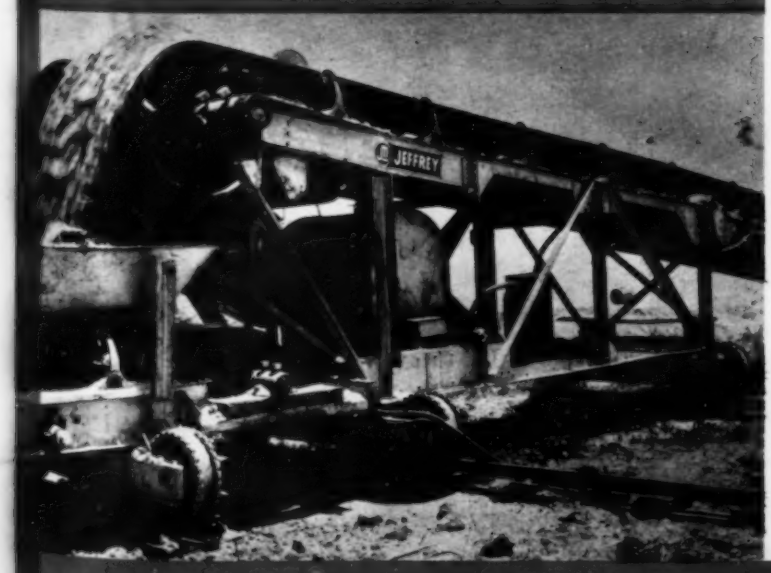
Address .....

City ..... State .....

On the FLORIDA SHIP CANAL

General view of the equipment and job showing how movements of the dragline were kept to a minimum both in lift and swing. Note how the main conveyors are "vertebrated" as short hinged sections to conform to the profile of the ground.

The 100' Boom Stacker is turntable-supported for swing and tractor-mounted for mobility. It has every needed adjustment for quick normalizing of the belt to operable position when the tractor chassis is tilted by irregular ground.



In this particular case the main conveyors are made mobile by mounting on flanged track wheels. The wheel bolsters are swiveled and provided with screws for levelling of the belt transversely.

Jeffrey "Muscled" Conveyors Increase Excavating Efficiency

The Jeffrey 36" Belt Conveyor System used by the Badgett Construction Company on the Florida Canal kept a 2½-yard dragline stepping at the rate of three passes a minute . . moved and stacked 8,000 to 9,000 yards of sandy ground every 20 working hours.

These conveyors are another of those Jeffrey combinations of flexible units especially designed to job requirements . . in this case, movable belts and a mobile stacker that marched down the canal, and then back, taking two full canal-width cuts to a total depth of about 33 ft.

Here is proved again that Jeffrey-designed Conveying Equipment will work hand in hand with excavating units to the common end of reducing over-all costs. Where and to the degree needed, the Jeffrey conveyor units are made mobile, self-propelling, extensible and flexible. With these characteristics of adjustability, the conveyors can be made to stay close to the excavators and economically take away and dispose of yardage as fast as it is dug.

Let us analyze your next job on this basis.

THE JEFFREY MANUFACTURING COMPANY

937-99 North Fourth Street, Columbus, Ohio

New York
Buffalo
Salt Lake City
Boston
Pittsburgh
Chicago
Philadelphia
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Cleveland
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Huntington, W. Va.
Detroit
St. Louis
Terre Haute

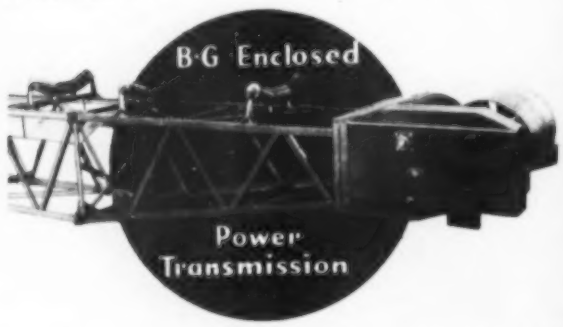
Jeffrey Mfg. Co. Ltd. of Canada
Head Office and Works: Montreal
Branch Offices: Toronto — Calgary — Vancouver — London

JEFFREY
MATERIAL HANDLING EQUIPMENT

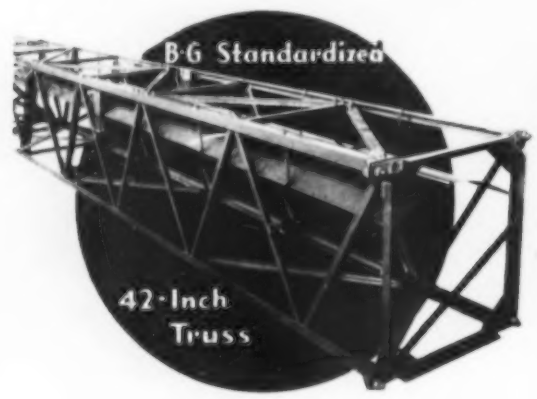
Via Barber-Greenes

Here are two new Barber-Greenes doing a perfect job in an ideal plant.

The conveyor on the right is 160′ long, with a Barber-Greene steel truss 42″ deep. This conveyor not only has fairly long spans, but carries an 8″ water pipe in addition to the walkway.



The left conveyor, which runs horizontally just above the ground, is mounted on wood stringers as no long spans are necessary.



Both conveyors are driven by the new Barber-Greene enclosed transmission, an all welded steel unit, dust tight, internally lubricated. This transmission is available in two sizes, has highest quality anti-friction bearings and precision made steel gears and sprockets.

The new Barber-Greene 42″ deep welded steel truss has all the well known B-G advantages, standardized sectional construction, quick easy erection, etc.

The carriers on both conveyors are the finest made by Barber-Greene: unbreakable, all welded steel base, end brackets die formed, oversize Shafer Self Aligning Roller Bearings. FOUR pass labyrinth grease seals keep the grease in and grit out.

The carriers alone justify your inquiry. Send a card or letter today for full information on Barber-Greene Conveyors. Remember we maintain a department for the sole purpose of solving your material handling problems the most efficient, economical way. There is no obligation.

BARBER-GREENE COMPANY

530 West Park Avenue, Aurora, Illinois

36-24

Select the Rope that Fits Your Job

Preforming individual strands completely relieves tendency of a rope to rotate as it passes over a sheave. Thus one movement causing fatigue is eliminated. Rope life is therefore greatly increased by preforming when bending is the principal destructive force. Preforming, however, adds to cost and does not increase resistance of rope to external abrasion. The extent to which abrasion and fatigue are factors in a particular use must be known in order to determine the economy possibilities of using preformed rope. We will give you the ratio if you tell us your use of wire rope. Writing today may reduce your rope costs.

WICKWIRE SPENCER STEEL COMPANY, *General Offices:* 41 East 42nd Street, New York. *Sales Offices and Warehouses:* Worcester, New York, Chicago, Buffalo, San Francisco, Los Angeles; *Export Sales Dept.:* New York. WICKWIRE SPENCER SALES CORPORATION, New York, Chattanooga, Tulsa, Portland, Seattle.

WIRE ROPE
by Wickwire Spencer

WICKWIRE SPENCER STEEL CO.
41 East 42nd St., New York City
Please send me your new Rope Manual that tells how to make wire rope last longer.

Name_____

Firm_____

Address_____

City_____ State_____

Performance

• Star performance makes Cletrac profitable on every kind of earth moving job. Cletrac power and economy and Cletrac controlled differential steering enable even inexperienced operators to deliver the yardage.

For example: Three Cletrac 80 Diesels with 12-yard scrapers, working on a 900-foot round trip haul, moved 85,450 yards in 814 working hours. Though conditions were adverse and new drivers were breaking in, the three Cletracs averaged 12 round trips per hour each.

All Cletrac Diesels have 6 cylinders and electric starting.

• Before you buy another crawler tractor, compare what Cletrac offers in price, power and equipment.

85,450 Yards in 814 Hours

Cletrac
Crawler Tractors
Built To Endure
REG. U.S. PAT. OFF.

THE CLEVELAND TRACTOR COMPANY
CLEVELAND, OHIO

Maple Street, Winnetka, Illinois, an old macadam road maintained with Tarvia since 1917. Maple Street's nineteen years of uninterrupted service is typical of the year-after-year service Tarvia roads provide.

The time and money economies of Tarvia extend to every branch of road-building and maintenance activity. There is a grade of Tarvia and a low-cost Tarvia method for every type of highway work. Tarvia roads are uniformly smooth, easy-riding, skid-safe—modern in every particular, and need only the simplest, most economical maintenance to keep them that way indefinitely. The Tarvia field man will gladly give you the details. Wire or write our nearest office.

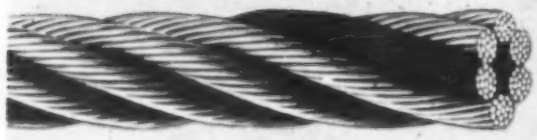
Barrett

TARVIA

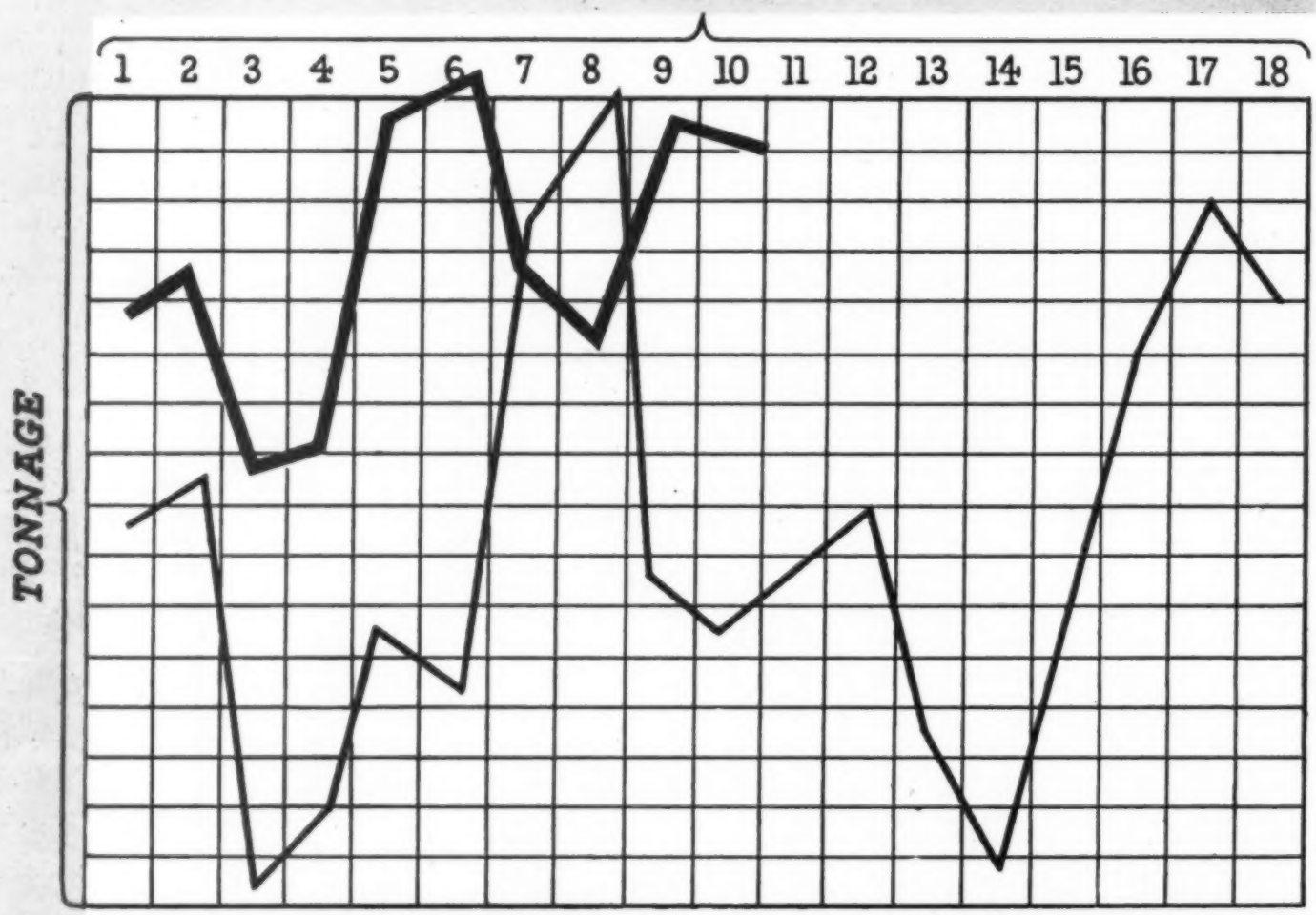
GOOD ROADS AT LOW COST

THE BARRETT COMPANY New York Chicago Philadelphia Birmingham Boston St. Louis Cleveland Minneapolis Lebanon Milwaukee Detroit Baltimore Columbus Youngstown Toledo Buffalo Providence Syracuse Hartford Cincinnati Bethlehem Rochester Portland, Me. Norwood, N. Y. In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver

A study in wire rope service . . .



CONSISTENCY



TRU-LAY PREFORMED ROPES — NON-PREFORMED ROPES

● Here is a graph that visualizes the *consistency* of TRU-LAY Preformed Wire Rope service.

The chart was taken from records of a large mid-western coal mine covering 18 non-preformed wire ropes and 10 TRU-LAY Preformed wire ropes. All ropes worked under identical operating conditions; were the same size, construction, lay and grade.

The ten TRU-LAY Preformed ropes gave an average service of far greater than the 18 *non*-preformed ropes.

TRU-LAY Wire Rope in operating service invariably gives increased tonnage and is more consistent in its service because it is preformed. Preforming makes a more uniformly high quality rope—for practically every job. And TRU-LAY is preferred because it is preformed by the American Cable Company.

Specify TRU-LAY Preformed for your next rope. Let an American Cable engineer help you. He has had 12 years' experience with preformed ropes.

AMERICAN CABLE COMPANY, Inc.
Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.
In Business for Your Safety

GREEN SIGNIFIES SAFETY

District Offices: Atlanta, Chicago, Detroit, Denver, New York, Philadelphia, Pittsburgh, Houston, San Francisco

TRU-LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

Behind the Quality of
GULF LUBRICANTS

is the world's most modern petroleum research laboratory

WHAT is the rate of oxidation of an oil? What chemical changes take place in an oil under severe service? What is the best oil for a particular type of bearing?

Gulf scientists are finding the answers to these and thousands of other questions regarding lubricants in Gulf's modern research laboratory shown below. Many types of experimental machines duplicate the conditions under which oils perform in actual service.

Thus, the knowledge gained by many years of practical experience in lubricating machinery of every type throughout 28 states can be supplemented with newly discovered facts. And the contractor who uses Gulf oils and greases is assured that *when science develops improved petroleum products* they will be available to him.

(Above) A new machine developed by Gulf engineers—the first that will test any type of bearing under precisely the operating conditions of actual service. It measures accurately friction, torque, temperature, wear and film thickness.

(Right) This complicated apparatus is used to study the behavior of oils at high temperatures in the presence of oxygen. Oils deteriorate rapidly under these conditions, forming organic acids, insoluble sludges and soluble impurities of high viscosity. Samples of the oil are withdrawn at frequent intervals for test, and the changes measured. Gulf oils have highest resistance to such deterioration.

(Below) A night view of the new laboratory of the Gulf Research & Development Corporation near Pittsburgh, Pa. In this laboratory are many machines and apparatus of various types which test lubricants under operating conditions similar to those encountered in actual service.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION—GULF REFINING COMPANY

GENERAL OFFICES: GULF BLDG., PITTSBURGH, PA.

THE Atlas Accordion Fold Electric Blasting Caps were first announced in the May 1933 issue of *Coal Age*. Their obvious advantages attracted tremendous interest—and caused their rapid adoption by blasters seeking to improve methods of blasting practice.

The Atlas "first" of 1933 has become the standard of 1936. Atlas Accordion Fold Electric Blasting Caps are used everywhere because of their convenience, safety and effectiveness. The Atlas Accordion Fold provides a package handy to carry and easy to open. The folded wires protect the detonator against external shock, yet unfold simply without kink or snarl. They are a fine example of how well Atlas products combine effective action with constantly improved methods of usage.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

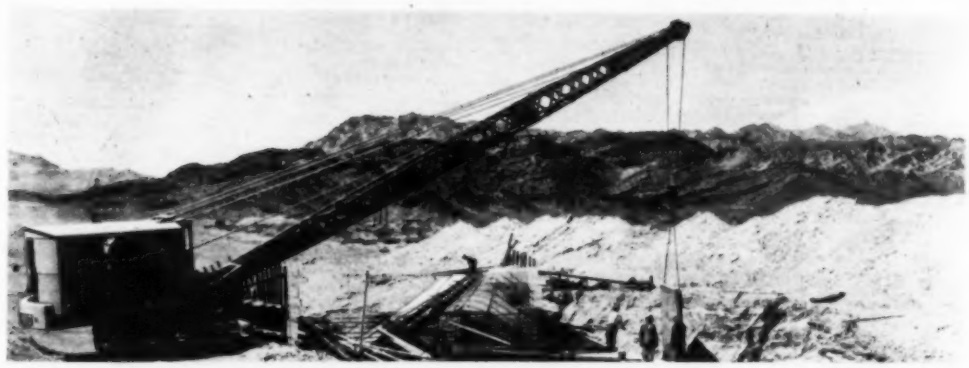
Allentown, Pa.	Joplin, Mo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
Boston, Mass.	Kansas City, Mo.	New York. N. Y.	Portland, Oregon	St. Louis, Mo.
Butte, Mont.	Knoxville, Tenn.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Denver, Colo.	Los Angeles, Calif.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
Houghton, Mich.	Memphis, Tenn.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS
EXPLOSIVES

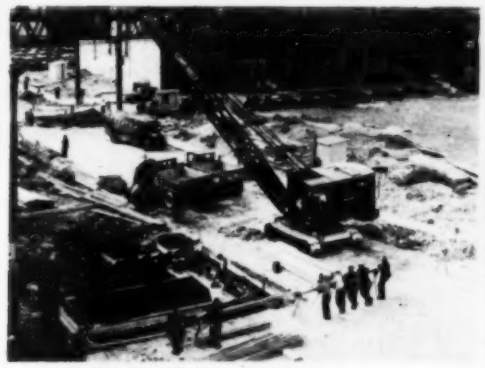
CHEMICALS ATLAS EXPLOSIVES

Gas operated crawler crane being used as a steam pile hammer.

HIGH SPEED PERFORMANCE *on Erection Jobs, too!*



Crane handling forms. Also used on this job for handling pumps and other equipment, concrete pouring, etc.



Crane equipped with grab bucket, excavating for abutments of viaduct.

Two cranes assisting in the handling of materials and pouring concrete with tub bucket.

ADVANCED ENGINEERING ...ABUNDANT POWER... STRENGTH...STABILITY LONG LIFE...LOW UPKEEP

● From 1 to 3 yds. capacity, heavy-duty built. Gas engine, Diesel or electric motor drive. All models can be shipped loaded on a flat car without dismantling.

LINK-BELT COMPANY
300 W. PERSHING ROAD - - CHICAGO

Offices and Distributors In All Principal Cities

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5647-A

Setting steel with improvised boom extension, at long radius on a single-part line at high speed.

Crane with special goose neck boom setting stone.

"Built for Speed"

LINK-BELT SHOVEL DRAGLINE CRANE

Let's Look at Cordeau - - for Giant Blasts, et cetera

What do we mean by "et cetera"? Anything from giant blasts to single shots, with well drill, wagon drill or jack-hammer holes; pocket, tunnel and broken loads; mud capping, demolition, ditching, and submarine . . .

Look at Cordeau-Bickford Detonating Fuse *for better blasting*. Maybe you can use it profitably.

1. ***More work from explosives*** because the line of Cordeau acts as a detonator for *each* cartridge in the hole. The detonating wave is carried by the Cordeau.
2. ***Less Hazard*** because Cordeau is an insensitive detonator—a lead tube filled with TNT. It must be detonated: ordinary shocks do not affect it.
3. ***Simplified Loading*** because no primers are needed in the loads.
4. ***Better Fragmentation*** because the Cordeau hook-up can be planned to fire each hole in rotation. *The time interval is infinitesimal*, yet it serves to *relieve burden*.
5. ***Equipment moved less often*** because drilling can be completed and all shots fired as a single blast—with Cordeau. When drills, pipe lines, compressors, scrapers, shovels and clearing gangs can be left in position until their work has been completed, we have a decided saving in time, labor and equipment.

Send for a copy of the Cordeau Book. There is no charge.

THE ENSIGN-BICKFORD COMPANY, *Simsbury, Conn.*

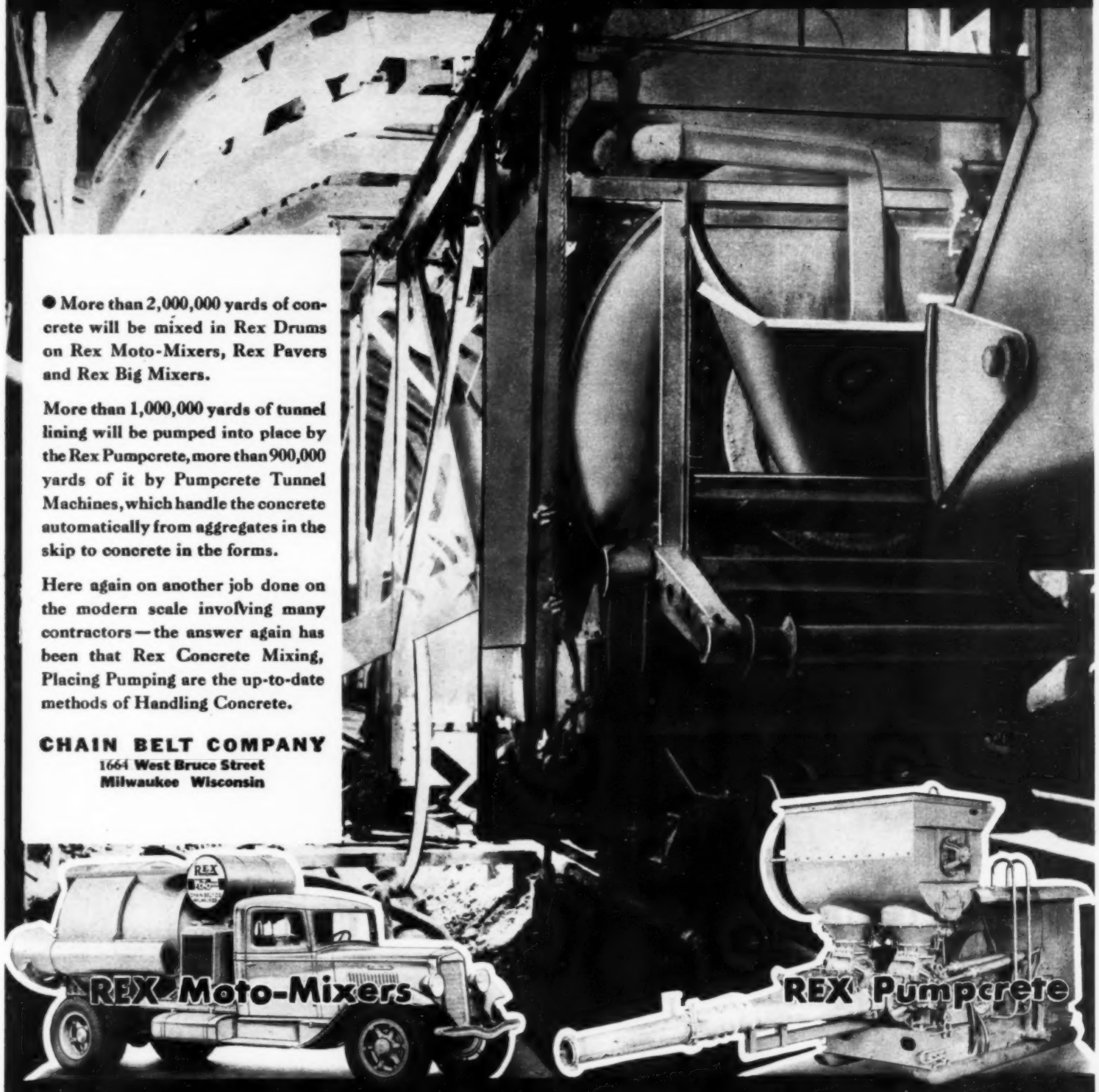
CORDEAU
DETONATING FUSE
BICKFORD

ALSO SAFETY FUSE *Since* 1836

THE ENSIGN-BICKFORD COMPANY

In the Metropolitan Water District

More than 2,000,000 Yards Will be Mixed in Rex Drums . . . 1,000,000 Yards More will be Pumped by the Rex Pumpcrete



● More than 2,000,000 yards of concrete will be mixed in Rex Drums on Rex Moto-Mixers, Rex Pavers and Rex Big Mixers.

More than 1,000,000 yards of tunnel lining will be pumped into place by the Rex Pumpcrete, more than 900,000 yards of it by Pumpcrete Tunnel Machines, which handle the concrete automatically from aggregates in the skip to concrete in the forms.

Here again on another job done on the modern scale involving many contractors — the answer again has been that Rex Concrete Mixing, Placing Pumping are the up-to-date methods of Handling Concrete.

CHAIN BELT COMPANY
1664 West Bruce Street
Milwaukee Wisconsin

The Up to Date Methods of Handling Concrete

REX

CHAIN BELT COMPANY
of MILWAUKEE

Construction Equipment

Traffic markers of Atlas White Portland Cement give this Tulsa, Oklahoma street four 10' center lanes, with an 8' lane on each side. Markers installed by the Standard Paving Co. of Tulsa, under supervision of State Highway Department. J. M. Klinglesmith, Resident Engineer; Chas. L. Wilson, State Highway Engineer.

CORNERS can be tricky and dangerous—deceiving to the eye of the most careful driver—a temptation to the smart alec driver who likes to cut corners.

Or, corners can be *safety lanes*, like those shown above. White lanes that are easy to see. Built of Atlas White portland cement, with an eye to *permanence*. For here is protection that will last as long as the pavement lasts!

That's the difference between markers that are *built right in* with hard durable Atlas White portland cement, and markers that are merely painted on. Atlas White markers can't wash off. They can't wear off. They can't fade out. There they remain—as efficient years hence as the day they were installed—durable and permanent guardians of life and limb.

Compared with temporary devices, the first cost is of course higher. But the difference is worth it. For the first cost is the last. There is never any maintenance or replacement expense. This economy-in-the-long-run feature is an important reason why street and highway officials everywhere are specifying Atlas White for marker jobs.

Help Build Safety into Streets and Highways with Atlas White Traffic Markers • Made with Atlas White Portland Cement • Plain and Waterproofed

UNIVERSAL ATLAS CEMENT CO.

United States Steel Corporation Subsidiary **208 South La Salle Street, Chicago**

M-6

ATLAS WHITE PORTLAND CEMENT FOR TRAFFIC MARKERS

Construction Methods

ROBERT K. TOMLIN, Editor

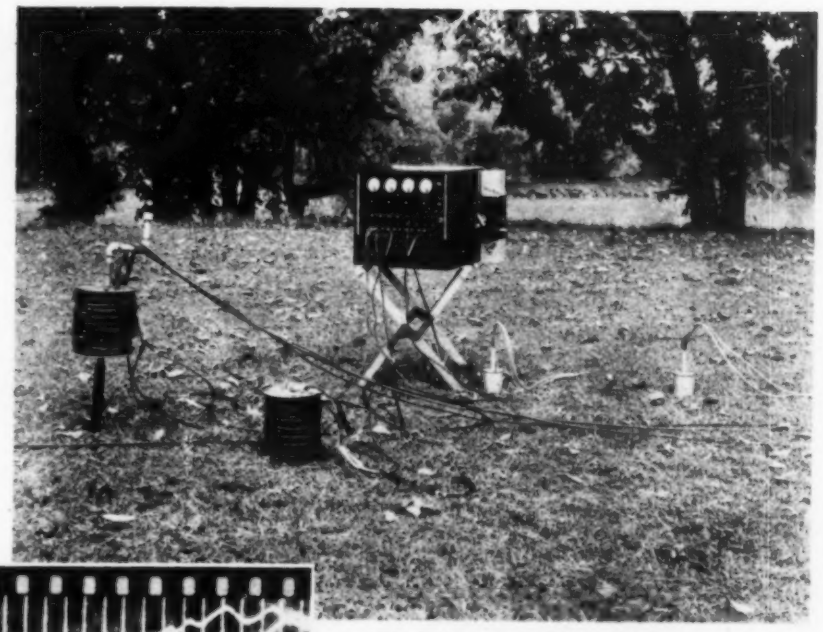
Established 1919 — McGraw-Hill Publishing Company, Inc. Volume 18—Number 7—New York, July, 1936

Sound-Wave Timing Locates

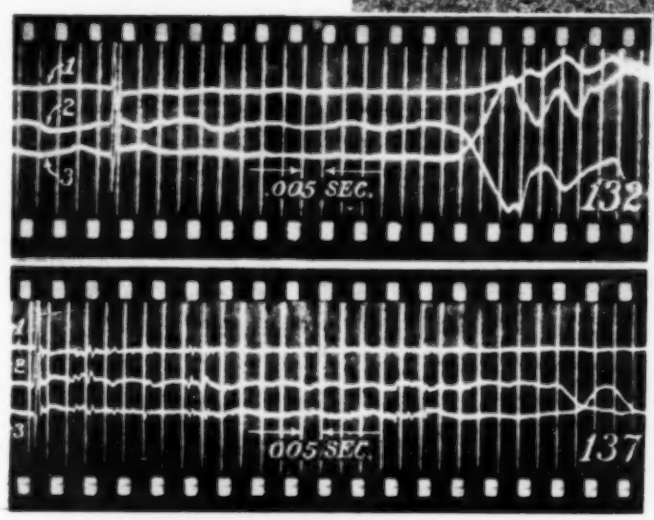
UNDERGROUND ROCK

BY PRECISE TIMING of sound waves racing through earth and through earth and rock, engineers of the Bureau of Public Roads have developed practical field methods for determining the distance below the ground surface to solid rock. These engineers have perfected an instrument by which measurements can now be made on the surface with apparatus that will indicate within a few feet how far below the surface rock will be found. Engineers need such information in planning bridges, buildings, estimating the cost of grading for highways and for other purposes. The measuring instrument is a highly sensitive electrical device known as a seismograph. The method saves the time and expense of drilling to find out how deep the rock lies.

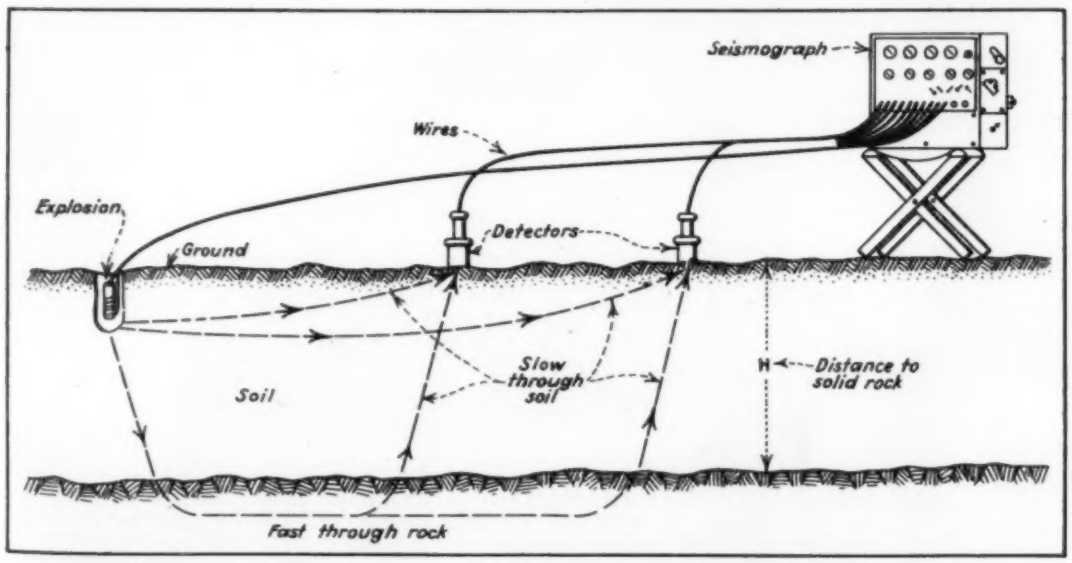
Accurate results are obtainable by measuring the speed with which an impulse from the explosion of a buried blasting cap or small charge of dynamite travels through the ground. Such an impulse will travel through soil at a speed of 1,000 to 6,000 ft. per second but the speed through rock is 16,000 to 20,000 ft. per second. A cap is exploded in the ground and at the same time the electric current exploding the cap causes a record to be made with precise apparatus for measuring time. Special detectors are placed at different distances from the explosion and pick up the impulse as it comes through the ground. The detectors are electrically connected with the time-recording device and the time of travel of the impulse from the explosion can be measured to a small fraction of a second.



ELECTRICAL SEISMOGRAPH set up for field use in determining depth to rock.



FILM RECORD of impulses from explosion of blasting cap or dynamite provides data for calculating rock depth.



ARRANGEMENT of explosive, detectors and wiring hookup with seismograph for timing sound waves.

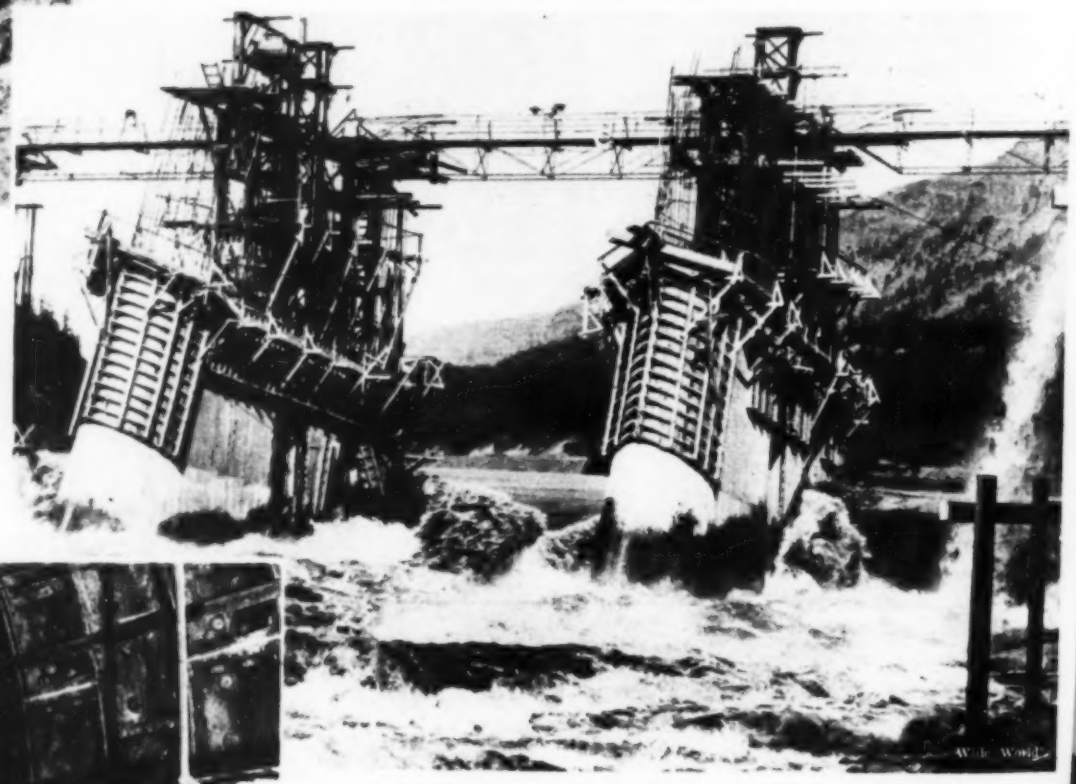
When a detector is close to the explosion one impulse coming through the soil is received. At a greater distance an impulse coming through soil is received and a second one moving down through soil to rock, through rock, and from the rock up to the surface arrives a fraction of a second later. At still greater distances the impulse moving through soil and rock arrives ahead of the impulse moving more slowly through soil alone. Knowing the speed of travel through soil and through rock and the time of travel through different distances it is possible to calculate how far the impulse went downward through soil before it encountered rock.

This method has been used extensively in prospecting at considerable depth for oil. Elaborate and costly apparatus has been used. The Bureau of Public Roads has now developed simplified apparatus that is giving excellent results.

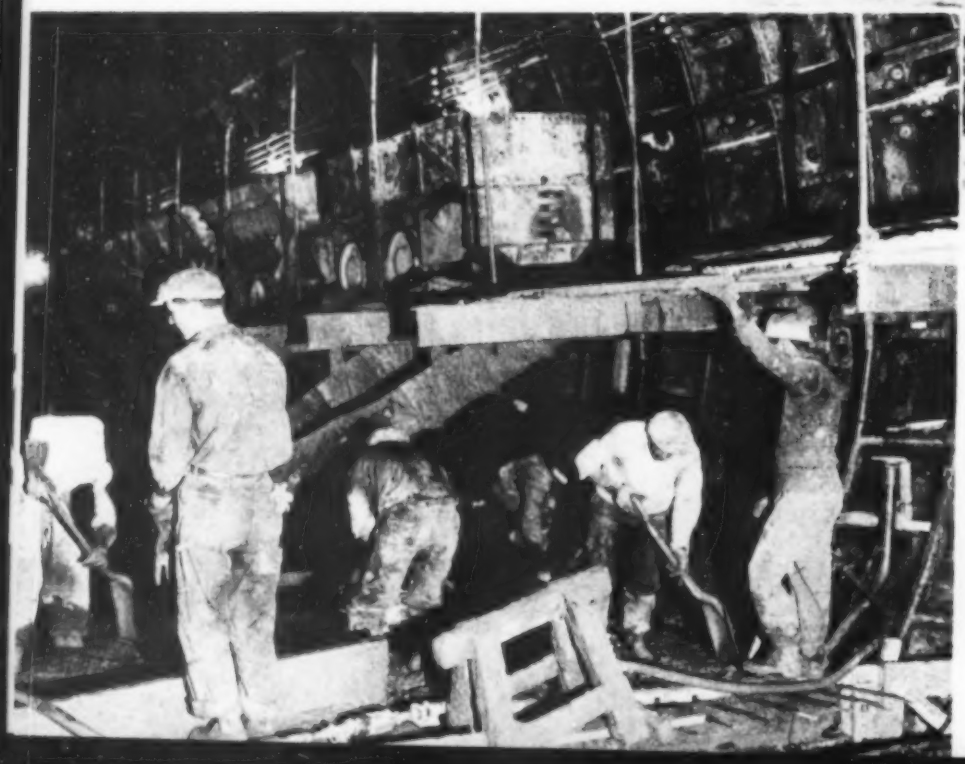
This Month's "NEWS REEL"

NEW YORK WORLD'S FAIR DESIGNERS meet in executive offices of New York World's Fair Corp. to make plans for giant exposition to be held on Flushing meadows in 1939. Members of board of design are: *(left to right)* Walter Dorwin Teague; Gilmore D. Clarke; Jay Downer; Stephen F. Voorhees, chairman; William A. Delano; R. H. Shreve; and Robert D. Kohn.

GUNTERSVILLE DAM on Tennessee River, 9 mi. below Guntersville, Ala., enters active construction stage as TVA starts driving long steel sheetpiles in cells of cofferdam inclosing navigation lock. New structure, estimated to cost about $29,000,000, will rise at head of reservoir created by Wheeler dam. Design comprises earth-fill sections 1,000 and 1,300 ft. long on two sides of river, concrete spillway 1,240 ft. long with maximum height of 80 ft., 340 ft. of power-house foundations for future power development and lock with single lift of 40 ft. Dam will store 240,000 acre-ft.

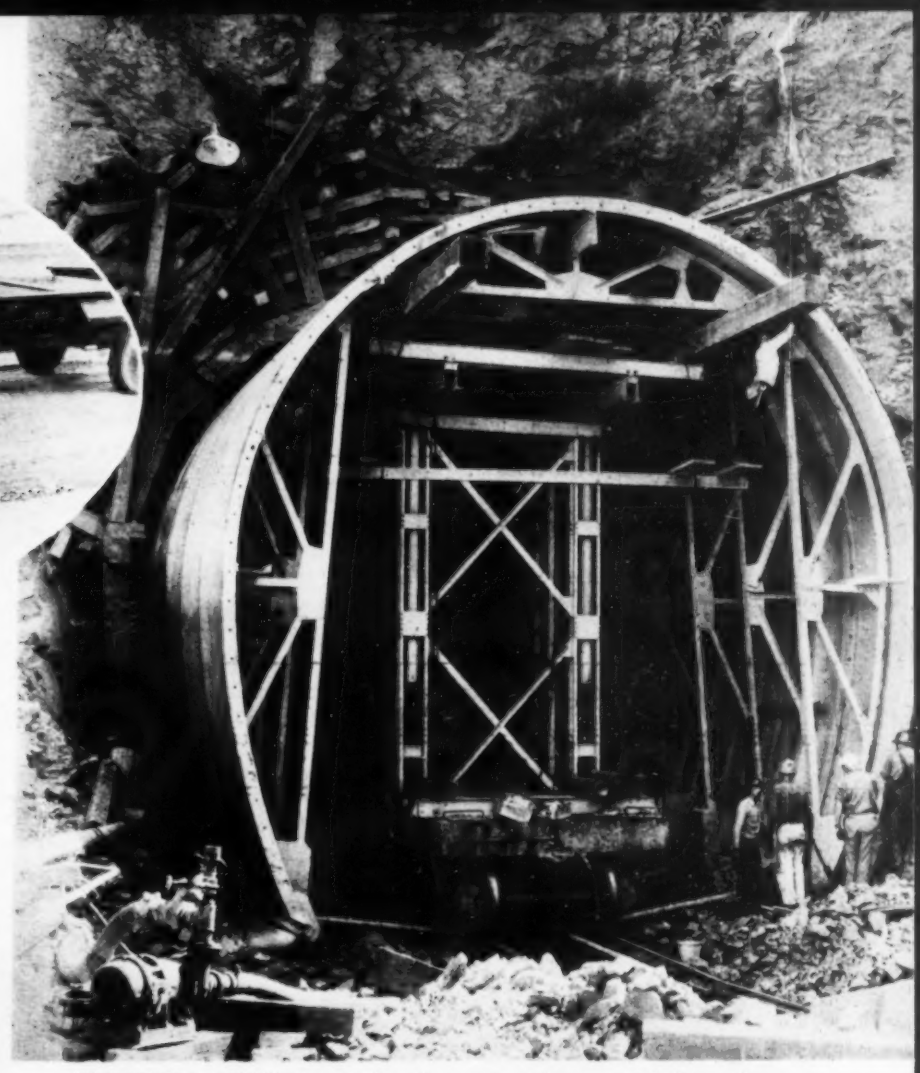


COLUMBIA RIVER SPRING FLOODS cause temporary halt in construction work at Bonneville, where waves 20 ft. high break against unfinished piers of south half of main dam, a concrete gravity structure about 1,100 ft. long, being built across north channel, between Bradford Island and Washington shore, by Columbia Construction Co., general contractor, under direction of Corps of Engineers, U.S. Army. Piers were built above flood level prior to removal of south cofferdam. North cofferdam has been completed in preparation for summer floods. After water recedes, north half of riverbed will be unwatered and this portion of dam completed.



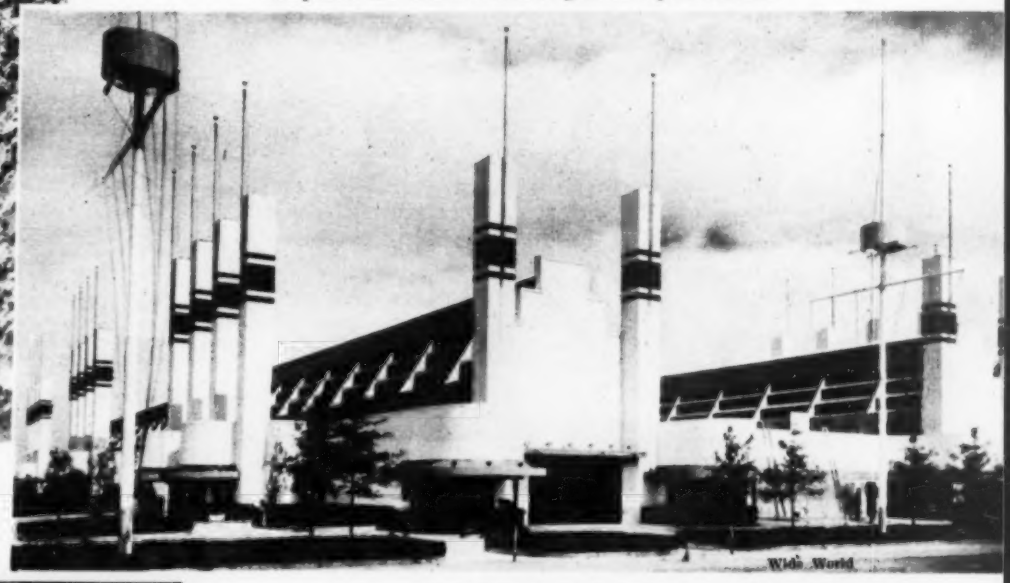
ROADWAY SLAB *(left)* in Midtown Hudson Tunnel, financed in part with PWA funds, is placed on movable forms from bottom-dump cars on overhead suspended track by Mason & Hanger Co., general contractor for Port of New York Authority. Tunnel, 31 ft. in outside diameter, provides roadway width of 21½ ft. and clearance of 13 ft. 7½ in. under ceiling, space above which is used as exhaust air duct. Fresh air is admitted through spacious duct under floor.

FOUR ELEVATING GRADERS loading 8-yd. pneumatic-tired trailers moved 30,000 cu.yd. in three 7-hr. shifts per day (with 1 hr. between shifts for greasing and inspection of equipment) on Southerland reservoir of Platte Valley Public Power and Irrigation District in western Nebraska. George W. Condon, of Omaha, Neb., contractor, moved 4,000,000 yd. of earth for reservoir embankment with four Adams elevating graders and truck trailers.



DIVERSION TUNNELS at Parker Dam, comprising two 29-ft. bores about 1,700 ft. long, will be lined with concrete to carry flow of Colorado River during construction of arch dam 340 ft. high by U.S. Bureau of Reclamation for Metropolitan Water District of Southern California. Steel forms for tunnel lining are moved on steel falsework mounted on flat cars. When in position for concreting, forms rest on concrete curbs built in advance. Arch and sides are completed before invert concrete is placed. J. F. Shea Co. has taken over operations on entire project, contract for which is held by Six Companies Inc. Frank Crowe is general superintendent.

LEVELING OPERATIONS at San Francisco airport make use of Barber-Greene belt conveyors to load trucks with earth shoveled on to belt by WPA workers. Long belt provides ample working range for large number of shovelers excavating earth bank.



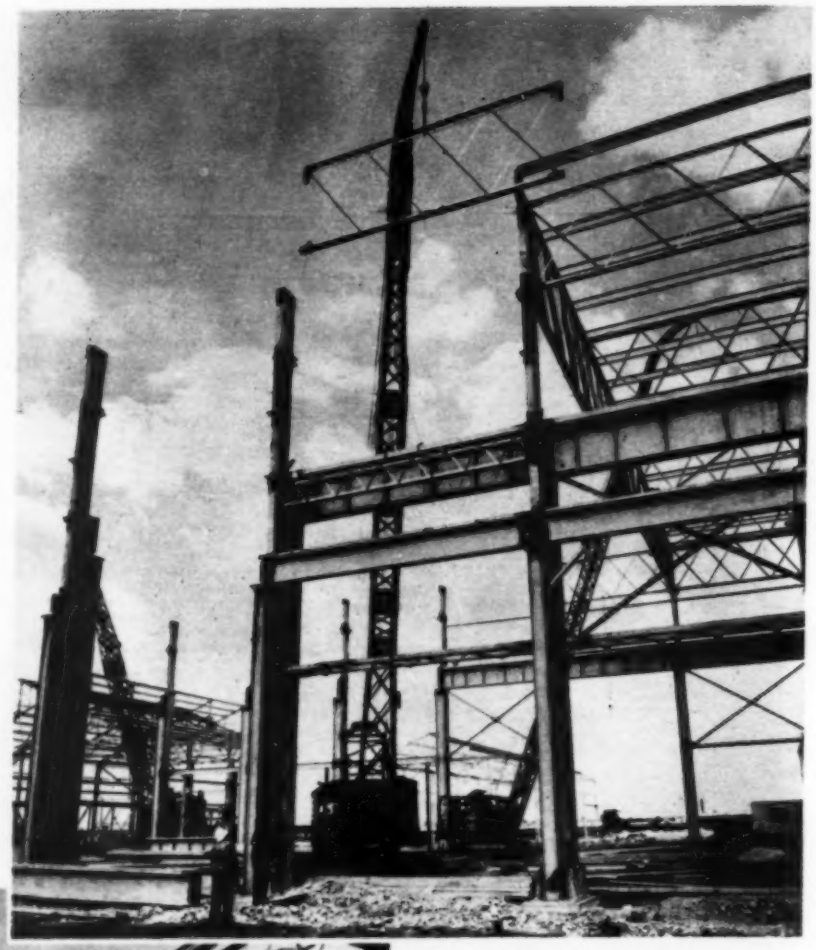
Wide World

CLEVELAND'S GREAT LAKES EXPOSITION celebrating centennial of city's incorporation opens June 27 for 100 days during which it is expected to attract more than 4,000,000 visitors. Modernistic architecture and extensive use of plywood as closure material distinguish automotive and other buildings on 150-acre lakefront site recently prepared for exposition by land filling and construction of roads and bridges. Many buildings are insulated to improve efficiency of air conditioning.

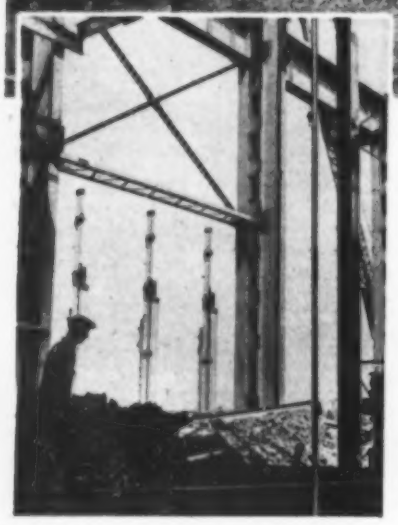
DEMONSTRATION FIRE-SAFE HOUSE in downtown Philadelphia has cinder-block walls laid up in ashlar pattern and painted white, steel casement windows and copper roof. Monolithic concrete foundation walls and concrete floors supported by precast concrete joists provide dry, durable and fire-resistant construction. Five Philadelphia builders are ready to erect house of this design with two bedrooms and bath on second floor, containing 27,000 cu.ft. in all, for $5,500 to $5,600. American Homes' Exhibitors with cooperation of Philadelphia dealers and contractors erected model house under direction of R. L. Girvin

Heavy Structural
WELDING
Completes 9 Buildings for Locomotive Works

HEAVY STRUCTURAL arc-welding, involving the use of 50,000 ft. of welding rods and 7½ tons of electrodes, played an important part in fabricating and erecting within a period of nine months, nine steel-frame buildings forming the world's first complete diesel locomotive works for the Electro-Motive Corp., a division of the General Motors Corp., at La Grange, Ill. The newly completed plant, occupying a 74-acre site and involving 2,000 tons of structural steel members, was built by The Austin Co., of Cleveland, Ohio, to facilitate the application of progressive production methods in the manufacture of locomotives weighing up to 200 tons. A feature of the installation serving the main aisles of the erection and machine shops is a 200-ton all-welded electric traveling crane, largest unit of its kind ever welded. Much of the welding was done right at The Austin Co.'s structural shop in Cleveland, from which 104-ft. roof trusses



GOOSE-NECK CRANES place structural steel for 550-ft. main erection aisle to be served by a 200-ton electric traveling crane with 100-ft. span.



MACHINE SHOP AREA and erection shop 550x170 ft. in plan, form largest building in plant. DETAIL *(at left)* of columns and bracing.

and 65-ft. columns, weighing 7 and 8 tons respectively, were shipped in prefabricated state to facilitate erection on the site. An indication of the extent of shop welding is seen in the fact that only 17 per cent of the welding rods and electrodes used on the job were shipped to the site.

Erection and Machine Shops—The largest building, 550x170 ft., houses the erection shop and machine shops. It is surrounded by 57,000 sq. ft. of horizontal sash, which even incloses the structure at the corners. The main erection aisle has a clear span of 104 ft., with 49-ft. clearance under the roof trusses. It extends for more than 500 ft. and consists of 24 locomotive construction bays, most of which are served by track laid transversely in the aisle. The individual bays have been designed for specific steps in locomotive construction and are closely related in function to adjacent facilities for heat treating, shot blasting, painting, etc., which are housed in individual structures that open directly on to the main erection aisle on the east. Track serving these bays connects with 2½ mi. of the company's service and test track which is served by a 200-ton track scale and approaches the plant from the east.

Alongside the erection shop and opening into it on the west is the machine shop. This has a clear span of 64 ft. and extends the full length of the main aisle. While transverse monitors provide for permanent lighting and ventilation in this part of the plant, the largest section of horizontal sash ever erected closes in its 550-ft. west wall with one broad sweep of glass which will be removed when contemplated expansion is carried forward.

Largest Welded Crane—Mechanical handling in these two major areas has been designed for a maximum of flexibility and avoidance of delay. In the main erecting aisle a 200-ton all-welded electric traveling crane, itself weighing 205 tons, has been installed on track supported on the structural columns which separate the main aisle from the machine shop on the west and from the heat treating, shot blasting, paint shop and other structures on the east. The concrete column footings rest on a floor of solid limestone 300 ft. thick, which underlies the entire site, about 19 ft. below the surface. This crane, equipped with four 50-ton hooks, has a one-piece all-welded trol-

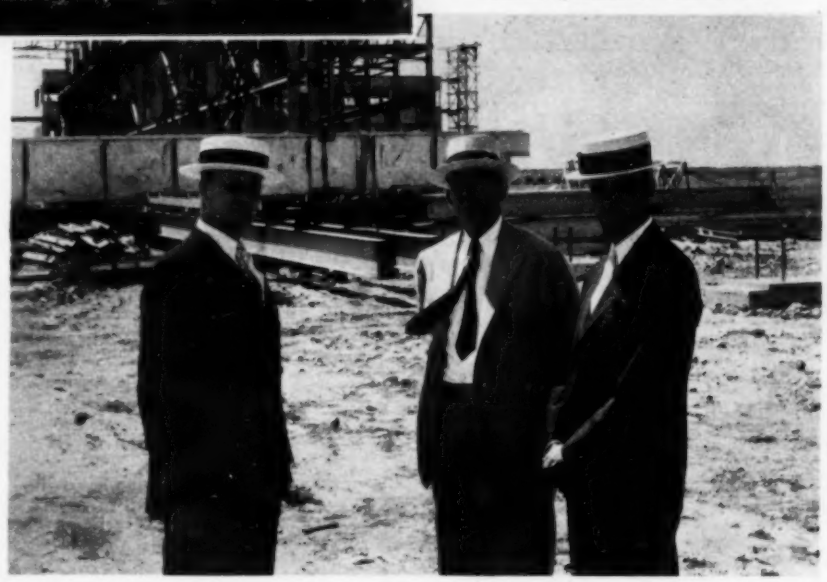
WELDED STEEL MEMBERS form 50 heavy columns, on concrete bases, to support 200-ton traveling crane serving erection and machine shops of plant.

ley frame and one-piece all-welded end trucks, with all-welded box girders and bearings of the MCB type.

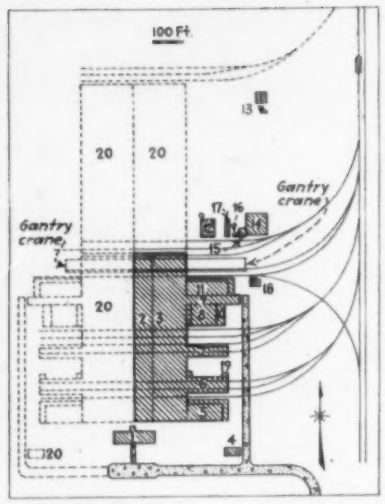
Two auxiliary electric traveling cranes of 30 and 40 tons capacity supplement handling facilities in the main aisles and the balcony precision machine shop. Power is provided by Winton diesel engines on test at the plant. This aisle is also served by a 15-ton gantry crane which passes transversely through the plant at the north end on rails in a double bay 48 ft. wide. This track extends 200 ft. along an unloading area outside the plant to facilitate bringing heavy materials into the shop. Two 20-ton traveling cranes answer handling problems in the machine shop.

Erecting the 200-Ton Crane—The 200-ton crane represents a noteworthy achievement for the reason that it is the largest unit of this kind ever welded. Its girders alone, fabricated from plates of 7/16 to 1⅛ in. in thickness, weigh 80,000 lb. each and required three flat cars to take care of their lengths in shipment. The trolleys were shipped in cars with specially constructed wells in order to negotiate railroad clearances.

A temporary track was laid into the building under two extra heavy welded roof trusses, installed to facilitate erection and future servicing of the crane. Steel blocks were lashed to these trusses to support lifts, the heaviest of which was 52 tons. The end trucks which carry the crane along the main aisle were set into place on the rails. Then, in order to raise the girders into place about 40 ft. above the track level, a special clamp was fitted to each and afforded the grip necessary to enable two locomotive cranes, one on each side, to hoist this load. The same procedure permitted the placing of the two trolleys on the crane girders.



BUILDERS AND OWNER. *(Below, left to right)* George A. Bryant, Jr., executive vice-president, Austin Co.; H. L. Hamilton, president, Electro-Motive Corp.; W. J. Austin, president, Austin Co.

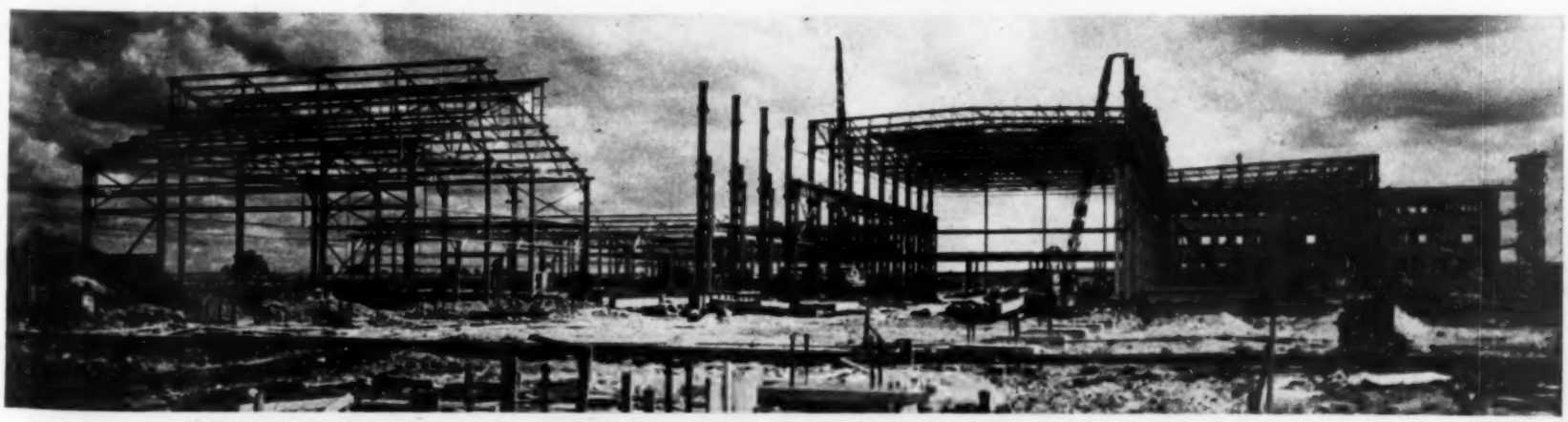


LAYOUT OF PLANT BUILDINGS and provision for future enlargement of locomotive works.

Key: 1—Office building. 2—Machine shop. 3—Erection shop. 4—Employment office. 5—Parts department. 6—Paint shop. 7—Sand blast. 8—Blacksmith shop. 9—Annealing oven. 10—Garage. 11—Warehouse. 12—Boiler house. 13—Sewage disposal. 14—Reservoir. 15—Pump house. 16—Switch house. 17 — Sub-station. 18 — Gas house. 19—Paint storage. 20—Future buildings.

When the maximum load of 52 tons was being raised, the two extra heavy welded roof trusses from which it was suspended deflected only ¾ in. at the center. This is of particular importance in the light of past experience which indicates, according to Austin Co. engineers, that riveted trusses under similar conditions deflect more than double this amount.

Coordination of all production operations was sought in the plant layout with the result that the unloading dock, blacksmith shop, annealing ovens, shot blast building, paint shop and warehouse for storage of locomotive parts adjoin the main erection aisle as integral branches on the production line. The annealing oven, 22x70 ft., has been constructed to receive the entire frame of the largest locomotive at one heat up to 2,000 deg. F. A flat car, surfaced with firebrick, serves as the base of this oven and transports frames or other parts directly from the main aisle over a track



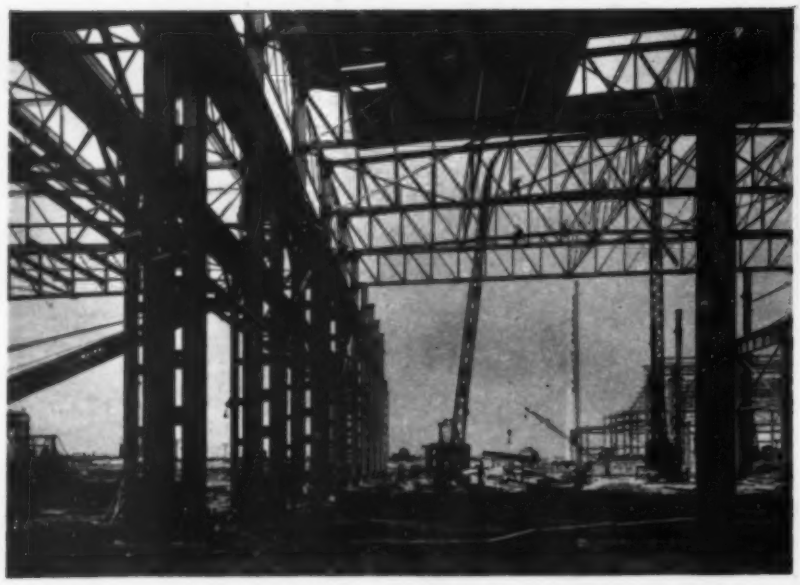
MAIN ERECTING AISLE and other plant buildings, nine in number, which involve 2,000 tons of welded structural steel. At right is office building, and along main aisle is machine shop structure. At left are warehouse, annealing ovens, blacksmith shops, paint and sand blast buildings.

leading from the erection shop to the oven itself.

Makes Own Power—At the north end of the main building is a testing room where two Winton diesel engines will be on test at all times. Power generated by these engines is adequate to meet the direct current demands of the plant. Because of the necessity for changing the engines on test at frequent intervals, this section has been fitted with a removable roof and can be served by the two cranes in the machine shop aisle. Adjacent to this engine test room is a locomotive testing pit and the power generated here can likewise be converted into constructive use in the plant. The works could operate entirely independent of all public service facilities.

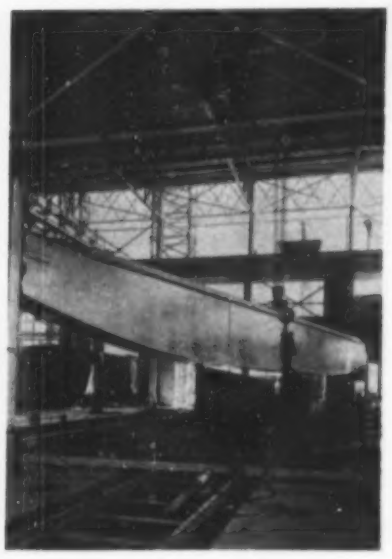
For The Future—The layout has been designed to accommodate shops four times the present size without augmenting the service facilities. It will permit extension of the plant to double its initial length without necessitating the installation of additional cranes, and duplication of such extended facilities on foundations partially in alongside the west wall of the present building. In this way, the 200-ton crane, the 40-ton crane and the 30-ton crane in the main erection aisle and the two 20-ton cranes in the machine shop, will be available for service over an area double that of the present structure.

After the present plant has been doubled in length and it becomes necessary further to expand the facilities alongside, the existing wall of horizontal sash inclosing the machine shop on the west will be removed. Column footings and columns on this west wall have been constructed in anticipation of this development, so that nothing further need be erected to support the roof on this side of the extended machine shop, and only stub columns to carry the crane girders.



WELDED ROOF TRUSSES, in prefabricated units, are being placed by long-boom goose-neck cranes to span main erection aisle of locomotive works.

MAIN CRANE GIRDER, *(below)* weighing 40 tons, is being raised to place by tackle lashed to two extra heavy arc-welded roof trusses, installed to facilitate erection and future servicing of 200-ton cranes.



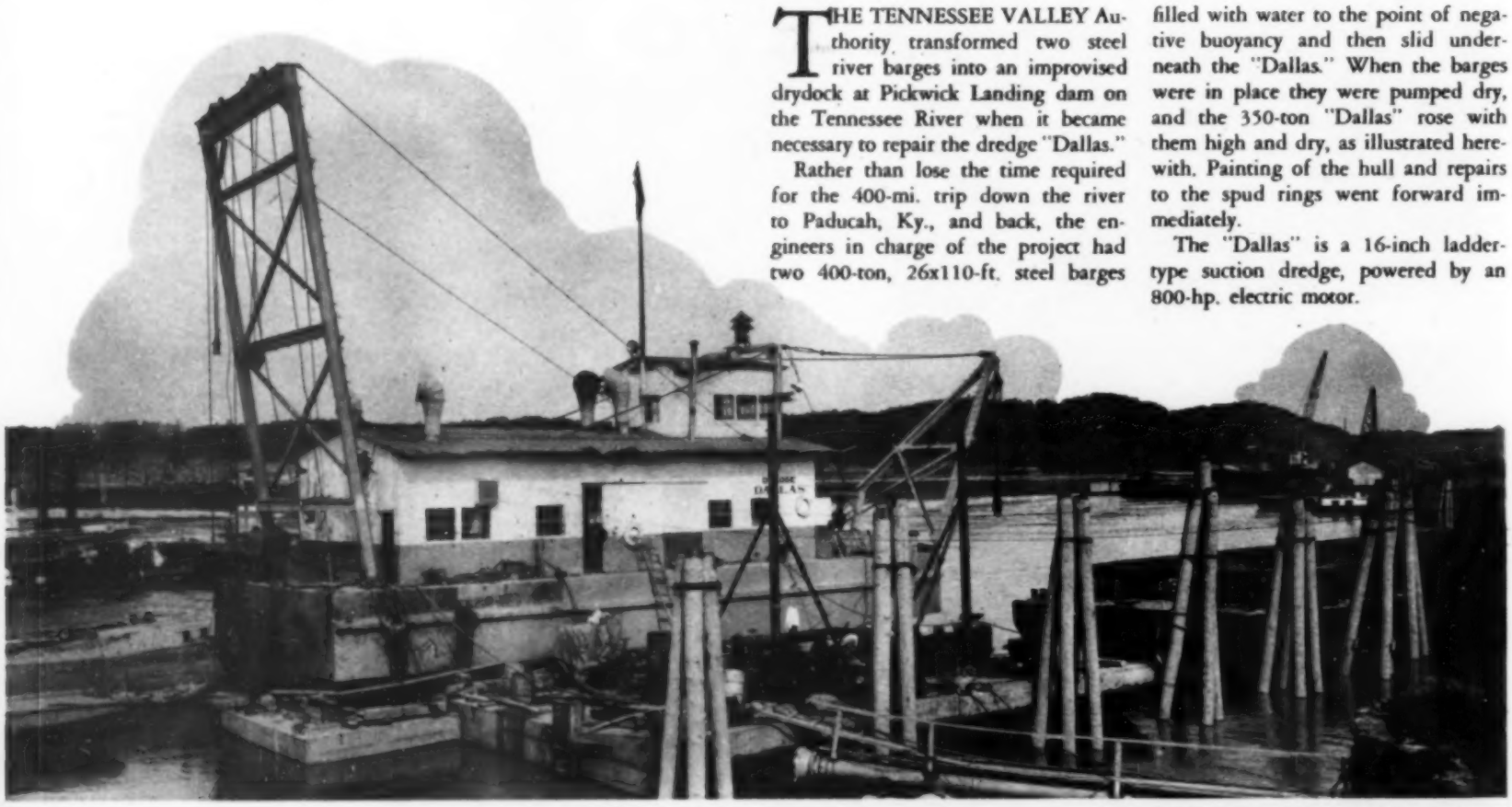
HEAVY CRANE RAIL, weighing 175 lb. per foot and securely anchored by bolts, extends for full length of 550 ft. along main erecting aisle of diesel locomotive works.

Improvised Drydock Raises Dredge

THE TENNESSEE VALLEY Authority transformed two steel river barges into an improvised drydock at Pickwick Landing dam on the Tennessee River when it became necessary to repair the dredge "Dallas."

Rather than lose the time required for the 400-mi. trip down the river to Paducah, Ky., and back, the engineers in charge of the project had two 400-ton, 26x110-ft. steel barges filled with water to the point of negative buoyancy and then slid underneath the "Dallas." When the barges were in place they were pumped dry, and the 350-ton "Dallas" rose with them high and dry, as illustrated herewith. Painting of the hull and repairs to the spud rings went forward immediately.

The "Dallas" is a 16-inch ladder-type suction dredge, powered by an 800-hp. electric motor.



Wisconsin Salvages and Widens

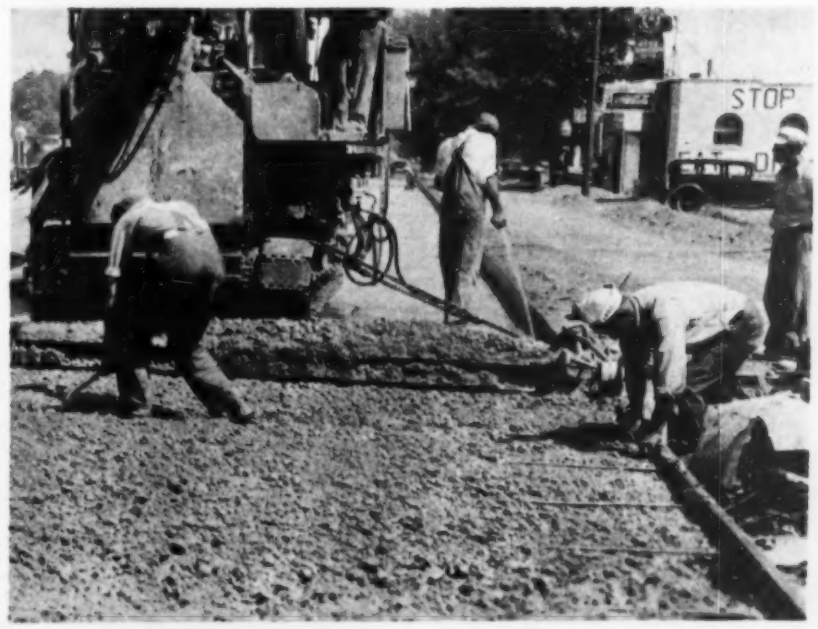
15-YEAR-OLD CONCRETE PAVEMENT

AS FIRST STEP in widening and resurfacing 18-ft. concrete pavement contractor sets 9-in. road forms 1 ft. outside two edges of existing slab and places concrete cap (averaging 5 in. thick) and 9-in. integral shoulders to new 20-ft. width, following this operation later with addition of third 10-ft. lane. STRIKE-OFF TEMPLET *(Above and in inset)* attached by chains to paver levels first layer of concrete 2-in. below finished grade to receive 58-lb. reinforcing mesh. Mechanical screed finishes surface of 20-lb. slab.

IN RESURFACING and widening a section of U.S. 12 between Madison and Middleton, the Wisconsin State Highway Department utilized a design quite different from that described in *Construction Methods*, October, 1934, pages 48-50. On that project (carried out on a portion of U.S. 42 near Kenosha) the highway department resurfaced an old, uneven 18-ft. concrete pavement with a new slab and cast two 6-ft. widening strips, one on each side of the old pavement, monolithically with the new slab. Between Madison and Middleton, on U.S. 12, the department employed a different procedure in recapping an 18-ft. concrete slab 15 years old and widening it to 30 ft.

In the first stage of the salvaging operation, the old pavement was resurfaced with a new slab having a minimum thickness of 4 in. and an average thickness of 5 in., reinforced with 58-lb. welded wire mesh installed 2 in. below the surface. Simultaneously with this recapping the 18-ft. pavement was widened to 20 ft. by adding 1 ft. of concrete 9 in. thick at each edge. The contractor used steel road forms 9-in. deep in placing this concrete, which was cast monolithically with the resurfacing. As soon as the resurfacing concrete had attained sufficient strength to support the paving mixer, the paver traveled on it to place the concrete in a 10-ft. widening strip of 9-6½-9-in. cross-section.

A further variation from the method followed on U.S. 42 occurred in the location of expansion and contraction joints. Because the old pavement on U.S. 12 had no longitudinal joint, the wire mesh reinforcement was made continuous across the full 20-ft. width of the new resurfaced and widened pavement completed in the first operation. Transverse expansion joints were installed wherever they occurred in the old pavement, and transverse contraction joints were formed in the new concrete at those points where transverse cracks were found in the old slab. Dowel bars were cast in the 1-ft. widening strip along one edge of the pavement to tie the 10-ft. widening strip to the 20-ft. pavement. In the 10-ft. widening strip, the design specified that expansion and contraction joints be installed to coincide with similar joints in the 20-ft. pavement.

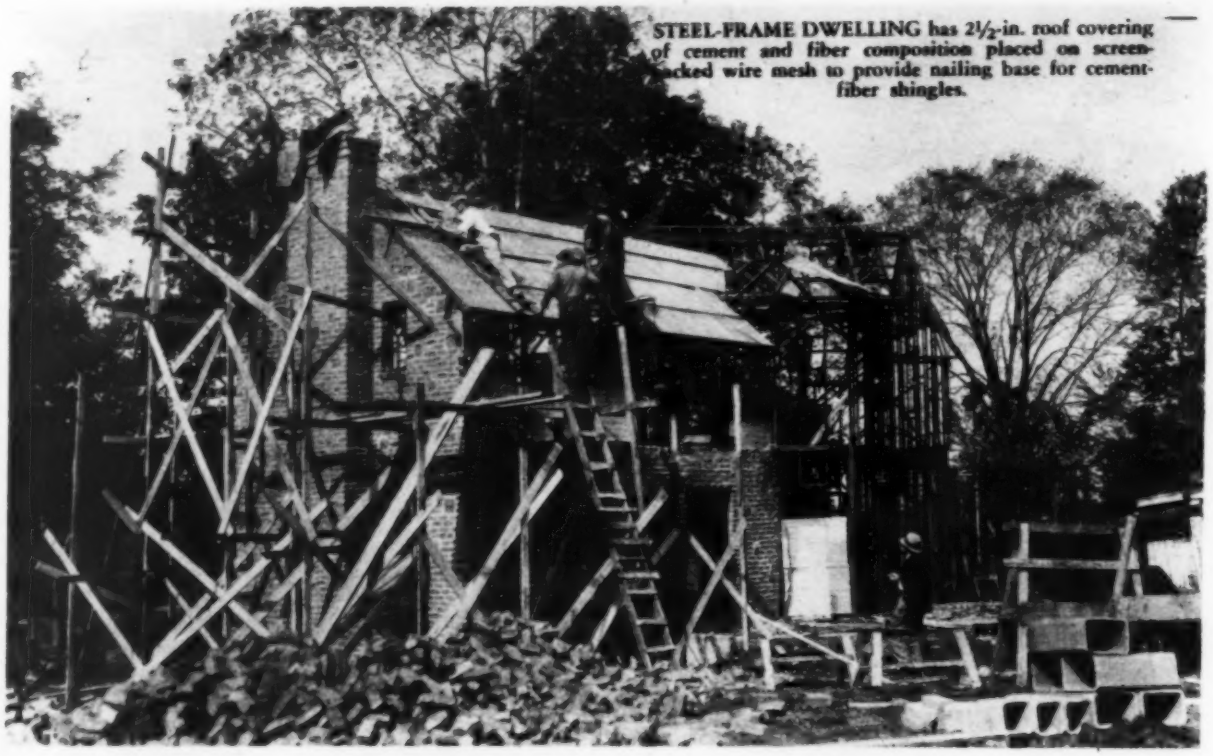


DOWEL BARS are installed along one edge of 20-ft. slab to tie this concrete to adjacent 10-ft. lane, placed on second trip of paving mixer.

The original pavement was laid in 1919. Traffic was detoured to other roads during the entire repaving job.

Under the direction of D. J. Minahan, division engineer, Madison, the work was performed by the Koch Construction Co., of Milwaukee, contractor.

STORY-HEIGHT steel-frame panels fabricated in the shop and welded together in the field make up the wall framing of a brick-veneer and stucco dwelling of eight rooms and three baths erected in 1932 by Brooks Parker, builder, of Tenafly, N. J. Designed with a rigid welded frame throughout and erected during the depth of the business depression, the house now has been occupied for nearly four years with entire satisfaction to both builder and purchaser. Steel-frame wall panels and gable ends were fabricated in units by electric welding in a Newark shop and were



STEEL-FRAME DWELLING has 2½-in. roof covering of cement and fiber composition placed on screen-backed wire mesh to provide nailing base for cement-fiber shingles.

FILLET WELD *(left)* in corner of dormer frame is made with electric arc. Two portable generators supply current for field welding.

House Builder Incorporates

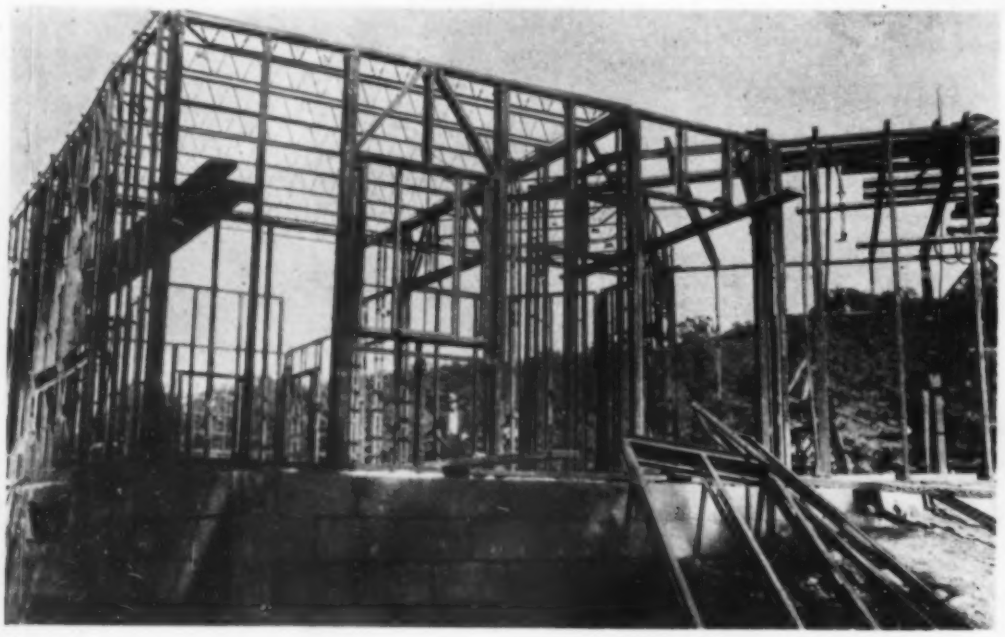
SHOP-WELDED WALL PANELS

In Fire-Safe Steel-Frame Dwelling

trucked to the site in Northbrae Court, Tenafly. Monolithic concrete foundation walls, steel pipe columns and bearing beams in the basement (supporting partitions on the upper floors), and open-web steel joists under 2-in. concrete subfloors provide rigid and practically fire-safe construction from cellar to garret. A steel roof frame is covered by a 2½-in. layer of concrete nailing material to which cement-fiber shingles are nailed.

Flexibility in the application of shop-fabricated steel-frame units permitted wide latitude in the design of the house, which has an appearance of age and individuality. Features of both architectural and structural design are

SHOP-FABRICATED WALL PANELS *(below)* for first story are erected on steel sill plate and connected by welding.



BRICK VENEER is laid up against wire mesh backed by waterproof paper, with 1 in. of mortar between brick and backing. Wire mesh is attached to steel studs by welded tie-wires. Steel casement windows are fabricated in wall frame units at shop. Vertical brick sills are admittedly inferior to cut or precast stone, but these sills have given no trouble in 4 years.

FREEDOM IN DESIGN is unhampered by any restrictions in shop fabrication of wall panels, gable ends and bay windows. Workmen on roof unroll wire mesh with screen backing across steel rafters between horizontal angle purlins.

indicated by the accompanying construction photographs. According to Mr. Parker, the slightly higher cost of the steel-frame construction is justified by the increased durability and safety of the structure.

Wall-Panels — Studs of the wall-frame panels consisted of two 1½x1½ x3/16-in. steel angles tied to each other at 15-in. intervals by welded yokes of steel strip which hold the two uprights a distance of 4 in. back to back, giving a normal 4-in. air space in the walls of the house. These studs were assembled and welded in the shop into wall units 2 ft., 4 ft., or 6 ft. long, with the studs spaced 2 ft., c. to c. At the top and bottom of each panel, the vertical steel angles were welded to horizontal angles, as indicated by one of the shop photographs. Wire ties were welded to the studs at each yoke for attaching paper-backed wire-mesh lath in the field.

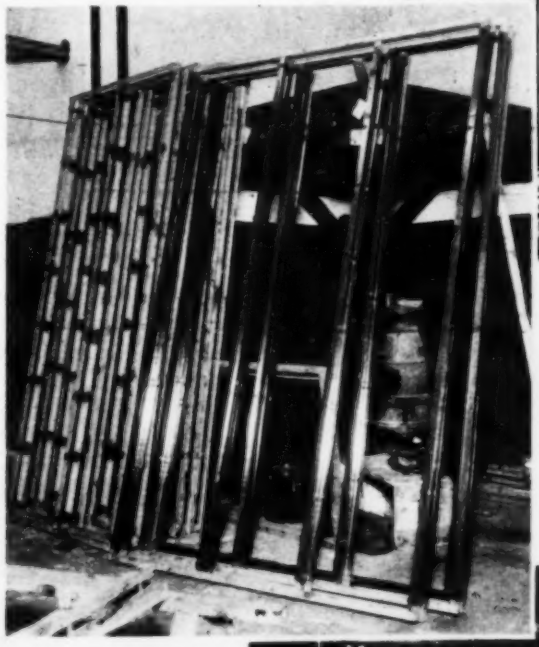
For the brick veneer wall the builder used a paper-backed mesh of 16-gage wire with a 2-in. spacing between the wires. Behind the stucco finish a similar mesh of 14-gage wire was used. In the wire-mesh lath, the paper backing was a tough, fire-resistant, waterproof material. Interior finish consisted of plaster on ½-in. fiber insulating board attached to the studs.

Erection Procedure—Standard wall panels were 9½ ft. high and 4 ft. long. First-story panels of this size were welded at three points to a steel sill plate 4 in. wide bolted to the foundation wall and were rigidly connected to each adjacent framing unit by four spot welds. Open-web joists of the first floor, resting on the concrete walls and on bearing beams, were spaced 20 in., c. to c. On the second floor, the joists were spaced at 24-in. intervals to rest on the studs of the wall panels. Second-story wall panels were erected on the first-story panels and were welded to them. Shop-fabricated gable ends similarly were erected and welded on the second-story wall frame. Steel casement windows were welded into the wall framing units in the shop.

Roof framing comprised 3-in. channel rafters at 24-in. spacing, resting on wall studs, with horizontal purlins consisting of two 1½-in. steel angles back to back welded to the tops of the rafters on 3-ft. centers. Welded wire mesh with a fine screen backing was laid between the angle purlins to serve as a form for the asbestos-concrete composition nailing material.

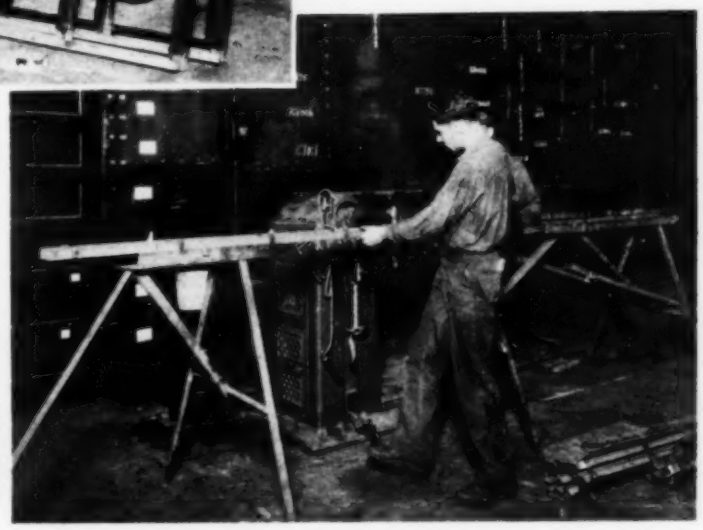
Concrete floors 2 in. thick were placed on the open-web joists of the first and second stories. Wooden sleepers cast in the concrete furnished nailing strips for the finished hardwood floors.

PIPE COLUMNS *(right)* and steel channels and I-beams carry partitions on upper floors. All stairs are steel, with wrought-iron railings. In background is entrance to two-car garage. Open-web joists are spaced 20 in. in first floor and 24 in. in second.



STUDS *(below)* consist of steel angles connected by welded yokes about 15 in. apart. Note tie-wires welded to yokes.

WELDED WALL PANELS made up of steel-angle studs on 24-in. centers, with angle sills and caps, are fabricated in shop for delivery to site.



WELDING MACHINE *(right)* spot-welds yokes to stud angles. Shop welding produces economical framing units for rapid erection in field.

ROUTE *(below)* of Atlantic-Gulf Ship Canal across Florida peninsula, connecting Atlantic Ocean with Gulf of Mexico.

FLORIDA SHIP CANAL

Excavated by Diverse Methods and Plant

LIEUT.-COL. BREHON B. SOMERVELL *(below)*, Corps of Engineers, U. S. Army, district engineer in charge of trans-Florida ship canal.

CRAWLER WAGONS are loaded by hand on one section of canal to give employment to relief labor.

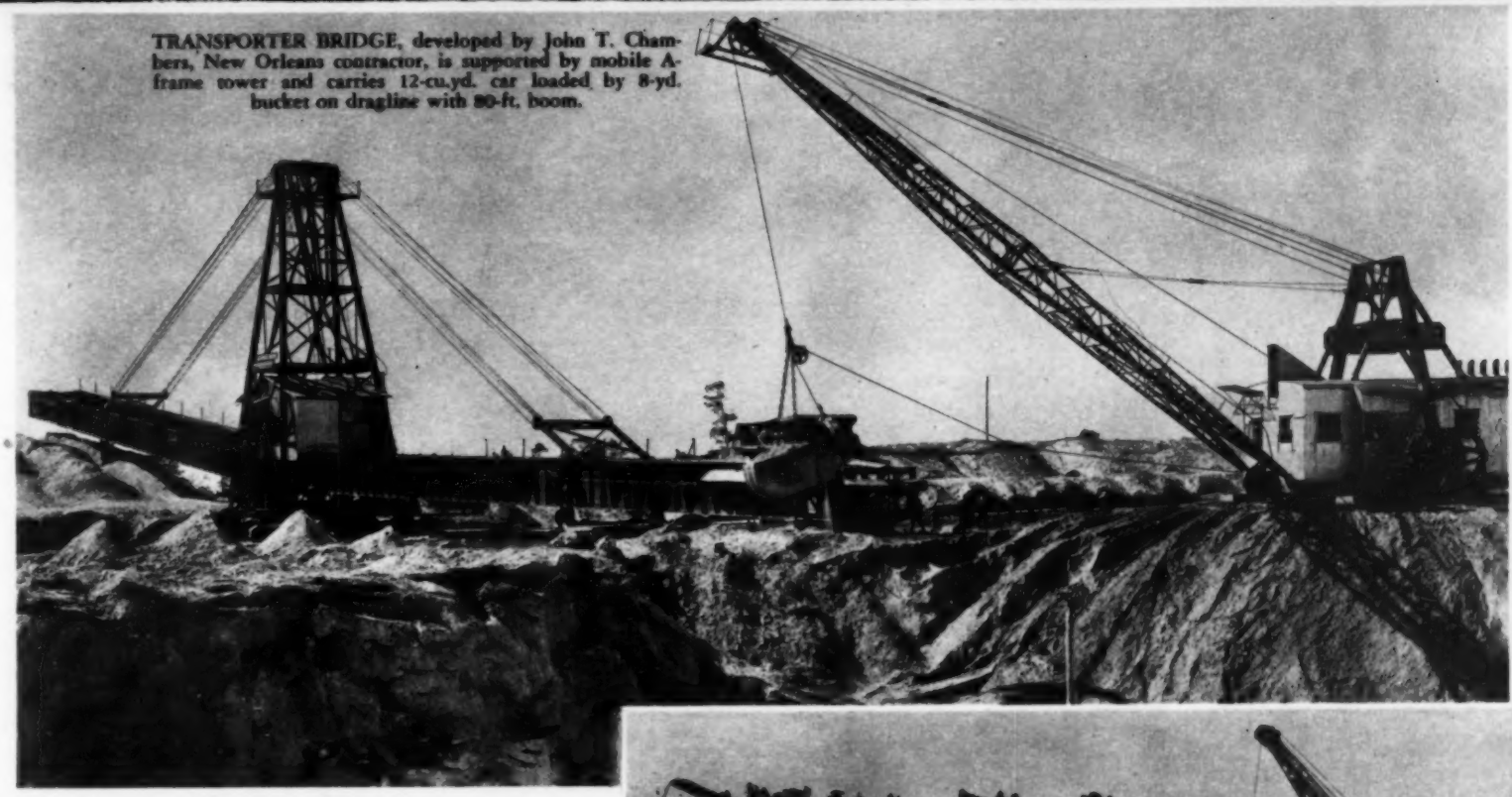
DRAGLINE loads pneumatic-tired La Plant-Choate wagons hauled by fleet of Caterpillar diesel "50" tractors.

WHILE FUTURE construction progress on the Atlantic-Gulf Ship Canal across the State of Florida is dependent upon provision of additional relief-works funds by the President to supplement the initial $5,000,000 appropriation authorized by him Sept. 3, 1935 and now practically depleted, the project, to date, has developed a wide variety of noteworthy earth-handling methods and equipment, illustrated herewith, ranging from simple hand labor and animal haulage operations to improved installations of mechanically loaded belt conveyors of great length.

Canal Route—Starting at Mayport, near Jacksonville, on the Atlantic coast, the canal follows the St. Johns River to Palatka and thence extends in a southwesterly direction to Port Inglis, on the Gulf of Mexico. The length of the route, including a 19½-mi. deepened access channel in the Gulf, is about 195 mi., of which 90 mi. require construction as new artificial waterway and 105 mi. involve

EXCAVATION AND TRANSPORT of earth from canal prism is handled by 12-cu.yd. Le Tourneau carryall scrapers hauled by diesel tractors.

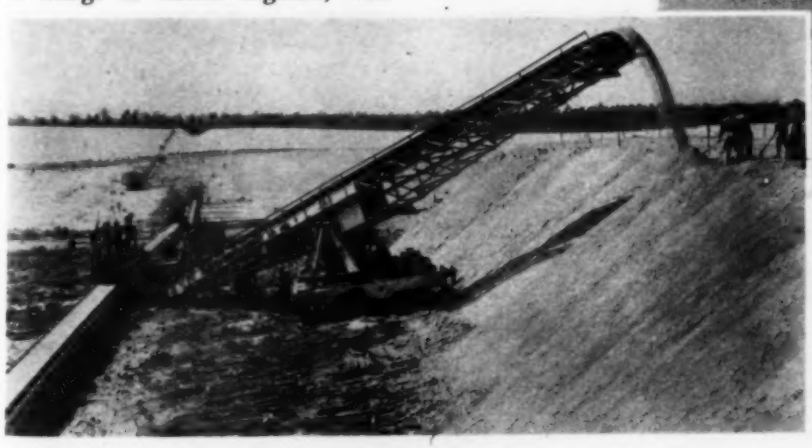
MOBILE BELT CONVEYOR *(below)* 800 ft. long moves and stacks earth alongside canal. Link-Belt installation, powered by electric motors, is loaded by 2½-yd. draglines.



TRANSPORTER BRIDGE, developed by John T. Chambers, New Orleans contractor, is supported by mobile A-frame tower and carries 12-cu.yd. car loaded by 8-yd. bucket on dragline with 80-ft. boom.

the deepening of existing river and gulf channels. The canal is designed for a navigable depth of 30 ft. and will operate at sea level, without the use of locks. The bottom width of the canal will be 250 ft. in artificial channel and 400 ft. in river deepening sections. The total estimated cost of the project is $146,000,000 and its construction is under the direction of the Corps of Engineers, U. S. Army, with Lieut.-Col. Brehon B. Somervell in charge as district engineer, with headquarters located at Ocala, Fla.

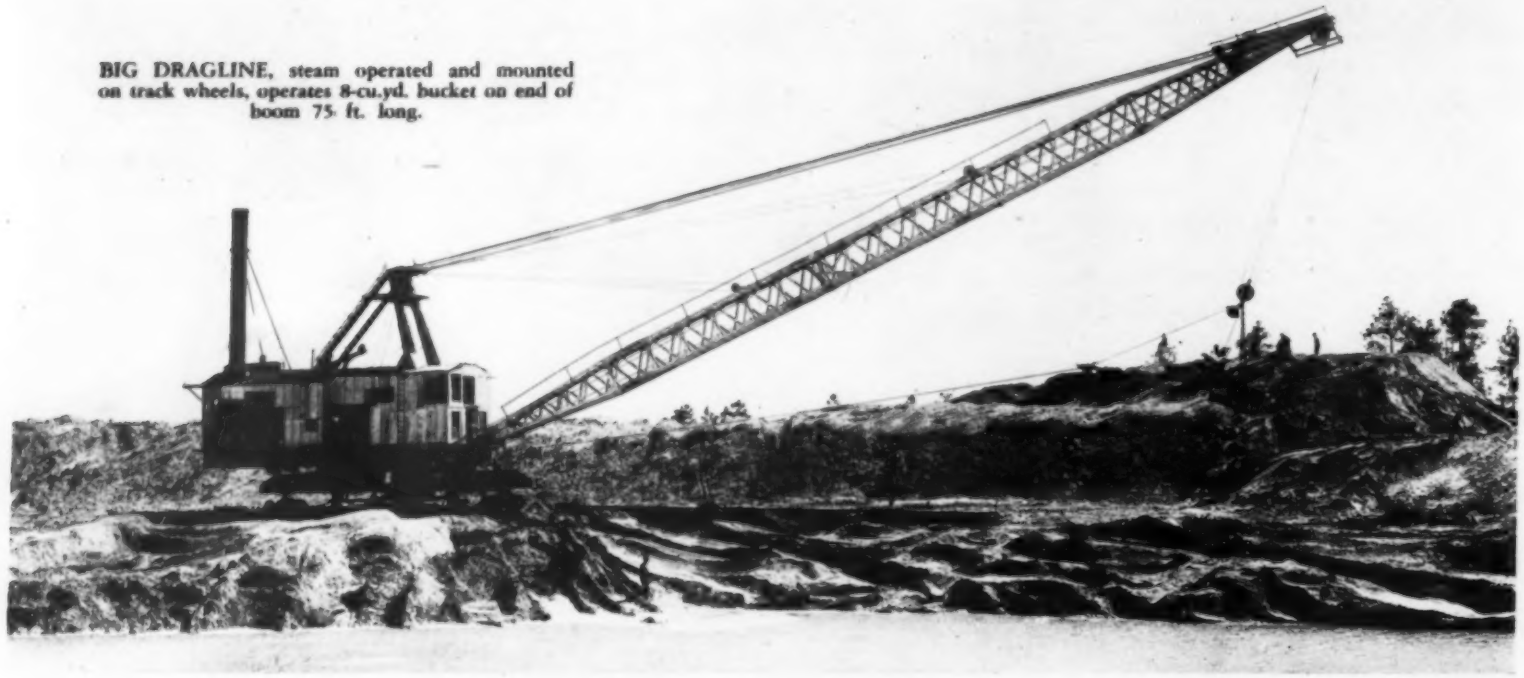
ANOTHER CONVEYOR *(right)* installation, by Jeffrey Mfg. Co., consists of short hinged spans track-mounted on flanged wheels. STACKER *(below)* has quick adjustments to keep belt level, crosswise, irrespective of ground contours



Excavation Yardage—The estimated volume of excavation required to complete the canal is 570,675,000 cu.yd., of which 401,965,000 cu.yd. are earth and 168,690,000 cu.yd. are limestone rock. About three-quarters of the excavation yardage is underwater work which it is planned to handle by dredging. In size the trans-Florida canal dwarfs the Panama Canal by a considerable margin, as indicated by the following figures:

Length: Florida, 195 mi.; Panama, 50½ mi.

Excavation: Florida, 570,675,000 cu.



BIG DRAGLINE, steam operated and mounted on track wheels, operates 8-cu.yd. bucket on end of boom 75 ft. long.

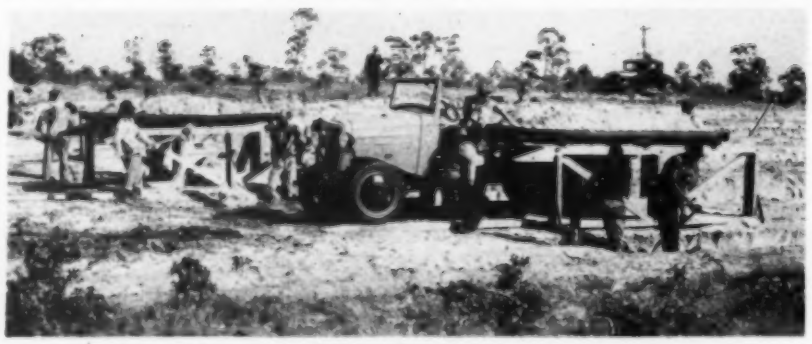
yd.; Panama, 288,000,000 cu.yd.

Work done to date has been largely by contract, although WPA labor has been employed for clearing, camp construction and on one section of canal excavation by force account. Contract operations have consisted mainly of a stripping cut on part of the main divide crossed by the route between the valleys of the Oklawaha and Withlacoochee Rivers near Santos, about 140 mi. from the Atlantic end of the canal. Common labor, from Florida relief rolls, receives 30c per hour and works 36 hr. per week in 6-hour shifts.

Types of Equipment—While future excavation of the canal prism will involve a large amount of dredging, operations up to the present have been confined to earth handling in the dry. The accompanying photographs illustrate the variety of types of plant that are being employed, including teams and scrapers, trucks and power shovels, long-boom walking draglines, railway trains loaded by dragline, tractor-hauled wagons of 12-cu.yd. capacity, 15-cu.yd. carryall scrapers, belt conveyors 800 ft. long and a combination bridge and car transporter supported by a mobile A-frame unit and loaded by dragline.

Contracts awarded for excavating the Florida ship canal cover about 13,500,000 cu.yd. at a total bid price of $2,915,180, or an average unit price of about 21.7c per cubic yard.

RAILWAY HAULAGE OUTFIT consists of 6-cu.yd. side-dump cars, loaded by dragline and moved in trains by 12-ton Whitcomb gasoline locomotive.



REMOVABLE TRUCK BODIES, in form of steel pans set on trestle frames, are loaded by hand shoveling and picked up by empty trucks backing up under frames.

Contractors — The contractors to whom awards for excavation have been made by the U. S. Engineer Department are as follows:

Lewis-Chambers Construction Co., New Orleans, 1,973,000 cu.yd. for $386,040.

Hooper Construction Co., Bunnell, Fla., 583,000 cu.yd. for $123,740.

Badgett Construction Co., Memphis, Tenn., 1,193,000 cu.yd. for $274,390. (Boone & Wester, Cairo, Ill., sub-contractor).

G. T. Auchter Co., Jacksonville, Fla., 1,352,000 cu.yd. for $302,618.

Harvey, Ray & Noonan, Pensacola, Fla., 1,933,000 cu.yd. for $405,930.

Benjamin Foster Co., Philadelphia, 4,741,000 cu.yd. for $1,024,056.

George S. Funk, Clarksdale, Miss. and Stevenson Co., Helena, Ark., 818,000 cu.yd. for $196,320.

Blythe Bros., Boyle Road & Bridge Co. and C. A. Fuller, Barnwall, S.C., 887,000 cu.yd. for $202,086.

Actual construction work on the Florida canal was begun Sept. 5, 1935. Of the initial $5,000,000 appropriation made for getting the work under way approximately half a million was allotted for clearing the right-of-way, another half-million for bridge foundations and a third half-million for constructing camp buildings, offices and shops, leaving a sum of approximately $3,500,000 available for the first stage of canal excavation.

TEAM AND SCRAPER METHODS of earth handling proceed alongside highly mechanized operations in order to meet requirements for employment of large number of men.

JOB ODDITIES

A MONTHLY PAGE OF

Unusual Features of Construction

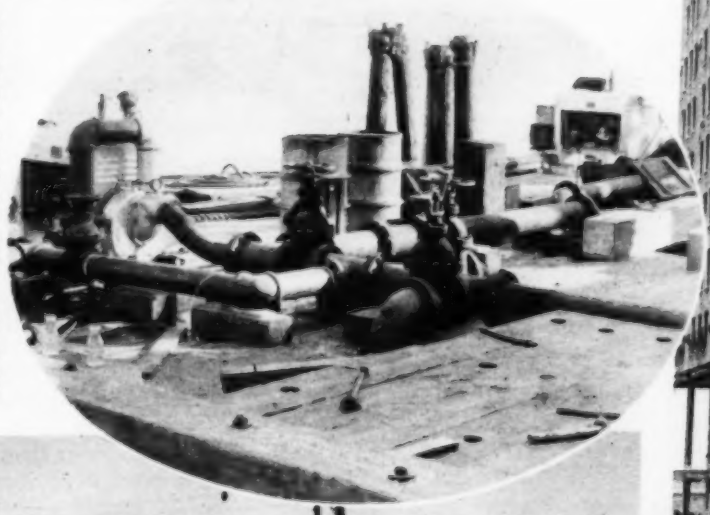
CAMERA CRANE *(below)*, mounted on motor truck, is equipped with 70-ft. extension boom carrying cage from which photographers were able to make special close-up action shots in rough terrain of Colorado River canyon for Warner Bros. motion picture, "Boulder Dam," featuring Ross Alexander and Patricia Ellis *(right)*. Truck-crane of type commonly employed on construction work is adapted to motion picture use, making possible effective views of rock-scaling and other construction operations on steep canyon sides at site of Boulder dam.

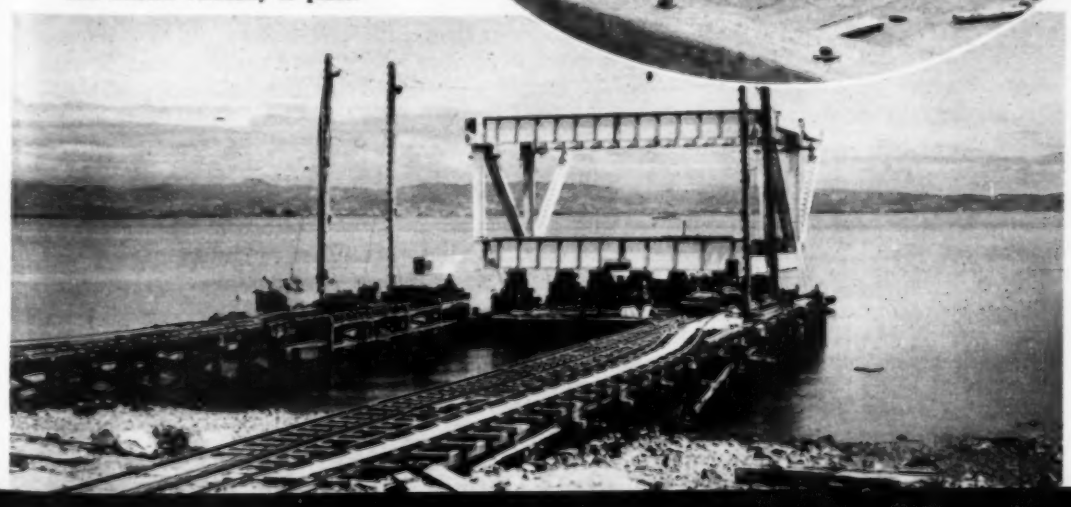
Globe Photo

SOUNDPROOF ROOFING of compressed straw, wired into large mats, is applied to new Pinewood motion picture studio building in Buckinghamshire, England, to insulate structure from external noises. Straw insulation layer is later covered with built-up asphalt roofing.

WAREHOUSE ON STILTS. Lower floors of 15-story structure at Eleventh Ave. and 35th St., New York City, are removed to allow railroad tracks to be built beneath building as part of project to eliminate "Death Avenue" where freight trains operating along street caused many accidents.

BUOYANCY OF BARGES *(below)*, equipped with battery of 6-in. Sterling gasoline-driven centrifugal pumps *(right)* to introduce or remove water ballast, was utilized at Islais Creek assembly yard of Columbia Steel Co. for loading 200-ton sections of steel superstructure for delivery, by towing, to San Francisco-Oakland Bay bridge. On pair of trestles extending from shore out into water *(below)* structural steel units, generally of two 30-ft. panels, were assembled. Barges, heavily ballasted with water, were then towed between trestles and spotted underneath fabricated section of steel bridge. After blocking had been placed between steel and barge deck water ballast was pumped out of hull, allowing barge to rise gradually and pick up its heavy load of structural steel, which was then towed out to point underneath cable suspension span of bridge and hoisted vertically to place.





GERMAN SUPER-HIGHWAYS

Provide Construction Program for 4,350 Mi. of Concrete and Bituminous Types

GERMANY has undertaken a 4,350-mi. program of national trunk-line highway construction for motor traffic (*Reichsautobahnen*) under a plan whereby control over railway and highway transport is unified under state direction. The following details regarding the project, providing for completion at a rate of 621 mi. of super-highway per year, beginning in 1935, are from a paper by Dr. L. I. Hewes, deputy chief engineer, U. S. Bureau of Public Roads, before the recent annual meeting of the Western Association of State Highway Officials:

The program involves construction of new routes rather than the improvement or relocation of existing roads. When in full swing it is expected to supply work to from 250,000 to 300,000 people, and to move about $180,000,000 into Germany's domestic economy every year.

Design—In the construction of the motorways it was deemed fundamental to decrease every hindrance or impediment to traffic. The normal road will have two separated traffic-ways, each 24.6 ft. broad (7.5 meters) with a mid-strip of 16.4 ft. (5 meters) and with 6.6-ft. shoulders (2 meters). Where the topography demands, or where diminished traffic will be served otherwise, there will be no middle strip and narrow shoulders; under these conditions traffic lanes 19.7 ft. wide (two 6-meter lanes) will suffice. In addition to the stretches with a maximum 2½-per cent grade there will be, in the mountains, gradients up to 6 per cent and over. Besides stretches of curved road with radius of 2,000 meters (6,562 ft.) or more, there will be lengths in difficult terrain where the radius wil be reduced to 400 meters or 1,312 ft.

A year from the date on which Adolph Hitler himself began construction on the ramp of the Frankfurter Main bridge, the *Reichsautobahnen Co.* had established 15 main division and 41 construction units. Up to July 1935, 932 mi. had been built or was under construction; By Dec. 1 1935, this figure was about 1,100 mi.

The total published cost of actual construction and overhead up to July 1, 1935, was $158,400,000 and up to Dec. 1, 1935, $259,880,000. The division of the cost up to the latter date is as follows:

GERMAN SUPER-HIGHWAY on Berlin-Stettin route opened to traffic in April by General Göring. Note 16.4-ft. traffic separation strip between 24.6-ft. widths of paved roadway flanked by 6.6-ft. shoulders on each side.

Right of way	$ 17,840,000
Administration, freight and rents	33,080,000
Contract construction work	208,960,000
TOTAL	$259,880,000

From these figures it is seen that right of way is nearly 7 per cent and overhead 12 per cent plus. From the figure of $208,960,000 paid for direct construction the cost per mile is $187,-632 for 1,100 mi. and the similar cost to July 1, 1935 was $131,115 per mile for 932 mi.

The motorways are to be constructed largely parallel to the chief German railway lines, but coordination is expected to eliminate harmful competition. Roads will not carry all freight great distances but rather parcel and bale delivery for shorter hauls. Heavy goods can still be carried more cheaply by rail.

Costs—The network of highways has been estimated at various total costs, the highest $800,000,000 for, say, 4,500 mi., seems about right at the present rate per mile. The economic savings have been variously estimated, the highest at $375,000,000 a year.

There seem to be employed in direct labor on the roads approximately 100,-000 men who average about 24½ hr. per week. On a yearly basis the resulting expenditure may be figured at about $1,800 per man-year. This seems to compare with the figure of $2,634 per man-year from a recent bulletin by the U. S. Bureau of Public Roads. That figure for American construction is based on 25.8 hr. per week. At the present time construction seems to be progressing at the rate of completing about 35 mi. of road per month.

Concrete Paving—The cement-concrete roads, 24.6 ft. wide, are quite generally reinforced with wire mesh fabric. Where necessary or where there is unfavorable subgrade, due to moisture or clay, a packing layer of broken stone, with an intermediate layer of gravel, is used as base or as sub-base. The typical cross-section of the reinforced concrete shows a two-course construction totalling 10 in. in thickness. The crown or camber is 1.5 per cent, which is nearly 0.2 in. per foot or approximately twice the present standards in this country. The top layer or top course of concrete is bent down to form a "sill" or inverted curb 10 in. wide inclosing the leaner concrete core. This top or wearing course seems to be about 3½ in. thick and its mix is about 6.45 sacks of cement per cubic yard, with broken stone coarse aggregate. The under course or "core" is a 5-sack mix with gravel aggregate. There is a 6.6-ft. shoulder, including a 30-in. border strip apparently for a foot-path or bicycles. There is a longitudinal joint in each of the 24.6-ft. wide going and coming travelled ways. The long radii and low standard grades previously have been mentioned.

It is expected that the center strip, with hedges, bushes, shrubs and trees, will absorb rays from car headlights. A luminous strip is proposed in the center of each road as a guide where visibility is bad, or in fog or mist.

Bituminous Construction — Typical of black-top construction is a 5-mi. section north of Darmstadt. The subgrade is sandy and porous and the fills are compacted by steel ram-plates, which are heavy disks raised and dropped by cranes. The subgrade is sprinkled for 5 hr. and again rolled.

There is then placed a compaction layer, or sub-base course, of about 8 in. compacted thickness, composed of broken quarry stone. On this sub-base is a second base course, filled with tarred splinters, of about 3¼-in. compacted thickness. Finally, there is a surface course of nearly 3-in. total compacted thickness, placed in two layers. As in the case of portland cement concrete construction there are outside of the travel lanes 10x10-in. reinforced concrete sills and the usual

BIG FILL on newly constructed section of German motorway near Munich. Paved traffic lanes are separated by central strip or continuous safety "island." Note use of industrial railway for construction operations.

shoulder of broken stone with bituminous splints.

The compaction layer or sub-base is made of broken basalt quarry stone set about 9½ in. high between carefully placed edge stones. The stone is placed perpendicular with its broadest surface down. The projecting points are then broken off and the voids wedged with stone. The stone is then rolled with heavy rollers and "trued up" with broken stone until the voids are practically full. Then it is covered with quarry waste dust or "meal", swept, and rolled again.

The 3¼-in. base, which is laid on this sub-base, consists of cubical sharp-edged broken basalt of uniform sizes of from about 1½ to 2½ in., and is laid true to profile and section, rolled and the cross-section corrected with broken stone and more rolling. There is next spread hard stone tarred splinters at the rate of approximately 55 lb. per square yard. These splinters are rolled into the stone base layer to produce the 3¼-in. thickness.

The bituminous top surface layer is either an asphalt-tar-concrete or a tar-concrete, both of approximately 3-in. thickness. The asphalt-tar-concrete top is constructed in two layers. The bottom layer is approximately 1.6 in. thick and of hard stone sized from about 0.2 in. to 1.2 in., with an admixture of 30 per cent of sand and 5 to 7 per cent of asphalt tar binder. This asphalt-tar-concrete is a mixture of 70 to 80 per cent of bitumen and 20 to 30 per cent of road tar. The finishing or surface layer is approximately 1.2 in. thick, and is made of a mixture of hard stone splinters and sand (approximately 2:1 of stone and sand) with an addition of 10 per cent of filler and 6 to 8 per cent of the same type of bituminous binder as is used in the lower layer. Mineral aggregate in this top layer is finer, running from approximately ⅛ to ⅝ in. Both of these layers are spread at temperatures approximately 320 deg. F.

With respect to the tar-concrete-surface course there are also two layers of approximately equal thickness. The under layer contains a mixture of small tarred stones or splinters of from about 1/5- to 1.2-in. size, mixed with 4 to 5 per cent of tar. This lower layer is laid cold, but the surface layer is built at a temperature of 140 deg. F. It is of broken stone sized from about ⅓- to 0.6-in., to which is added 10 to 15 per cent of stone dust as filler, and from 5½ to 6½ per cent of road tar.

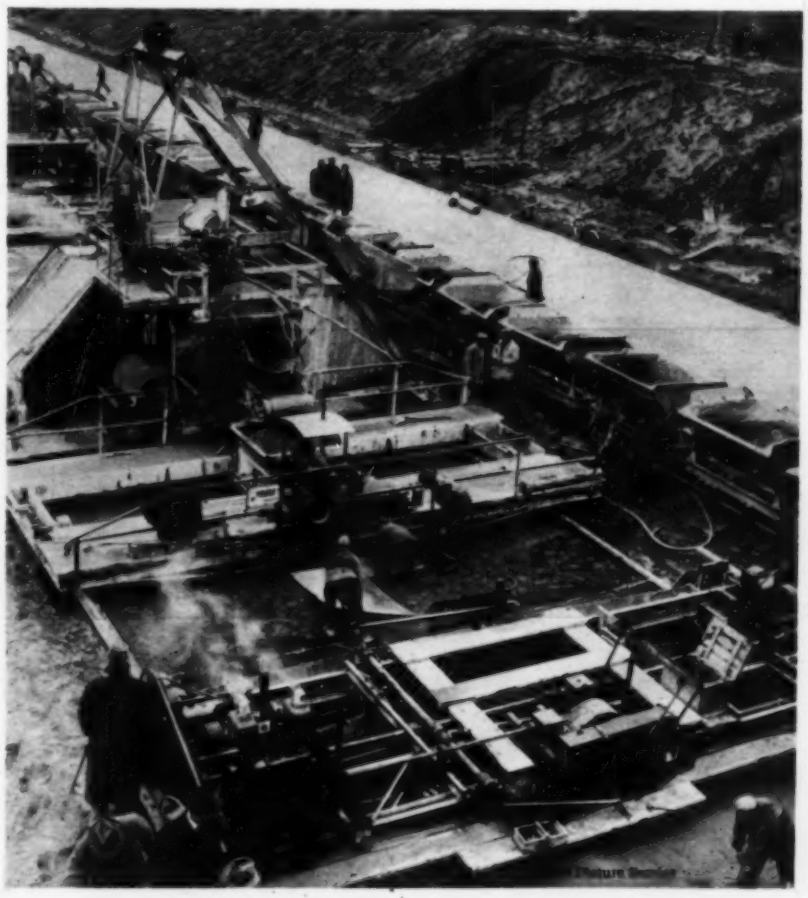
For the particular stretch north of Darmstadt, the material for the sub-base was delivered to a railroad depot approximately 1½ mi. from the job. Then industrial trains were run on to the job on tracks in the separation or parking area. The material was dumped from the trains and distributed by hand to both roadways. The other dry material was similarly delivered. The tarred splinters and cover stone were mixed at the quarry, and also similarly brought to the job.

The material for the surface layer was brought first to a near-by mixer with the usual drying and heating drums, and the batches were weighed and mixed. The mixed material was then transported by special industrial cars into which it was dumped from the mixer. All trains of industrial cars are operated by diesel locomotives.

The surface is finished with two mechanical finishers, which work one behind the other. The first one smooths the deposited material and the second one runs forward and backward and has a compacting effect. Rolling follows with a roller with rear wheels on separated axles, as in an automobile. The rolls are sprayed in order to prevent adhesion. Also, the finishing machine carries a little water container and a compressor to spray the strike board or screed. The finishers often run at an angle of 75 deg. to the center line to stagger any irregularities that may remain in the final finish.

The lower course of the tar-concrete is not subjected to the finishing machine but merely rolled, trued up with a mixture of small-sized material and then re-rolled. The top layer, as indicated, is laid at a temperature of approximately 140 deg. F. The general construction methods are the same as for the asphalt-concrete.

This construction of German motor roads now proceeding will develop the longest mileage of what might be termed "super-highways" that exists anywhere in the world.

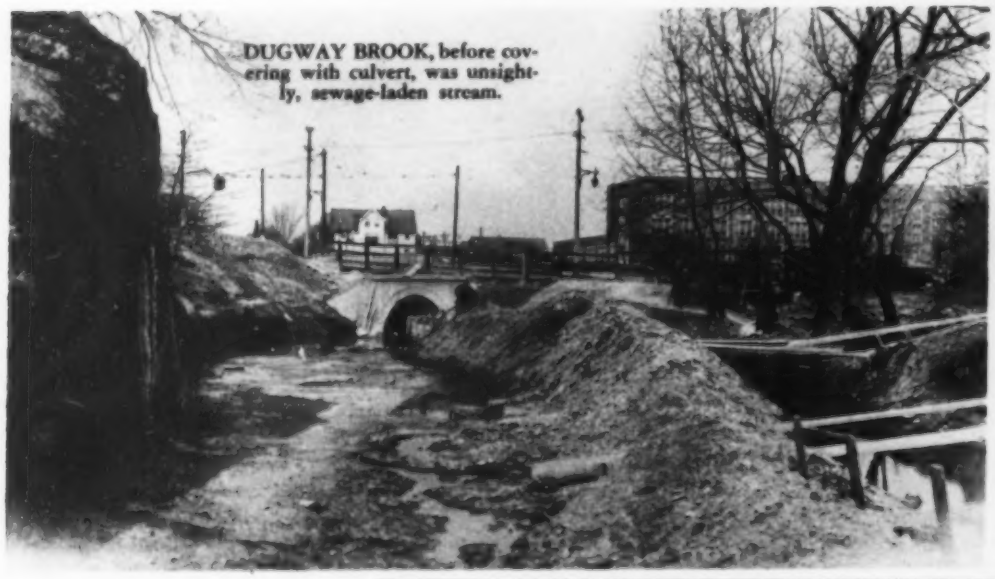


CONCRETE PAVING MIXER and finishing machines building motorway between Berlin and Stettin. Batches are delivered by industrial railway to charging skip on inclined track.

Sectional Plate Arch Culvert

TAILORED TO FIT

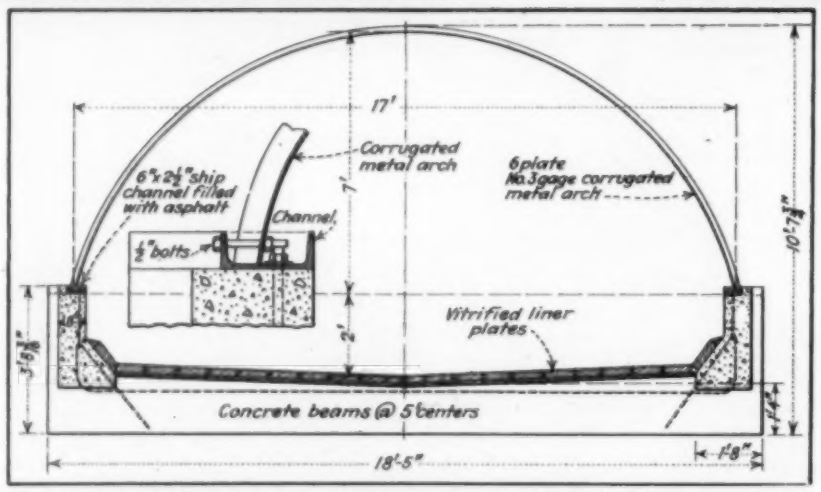
Curves in Course of Meandering Brook



DUGWAY BROOK, before covering with culvert, was unsightly, sewage-laden stream.

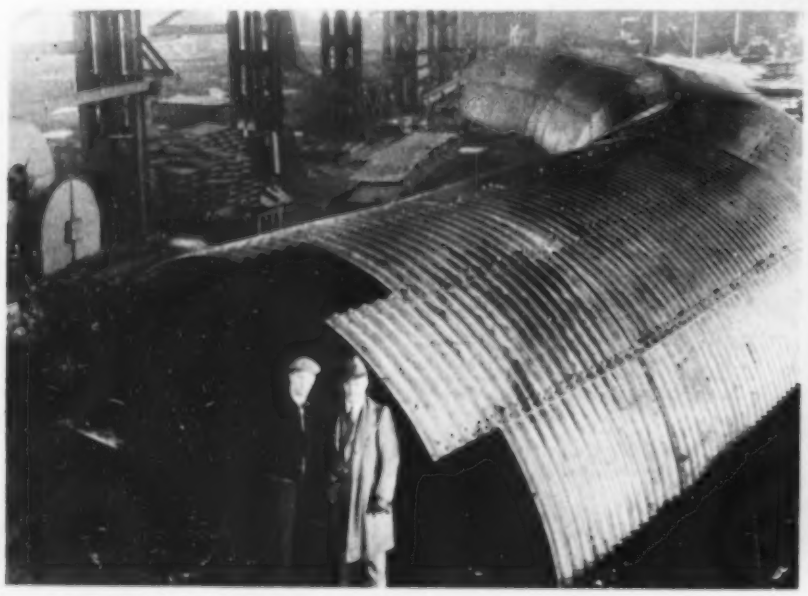
CORRUGATED PLATES are bolted to form 17x9-ft. semicircular culvert on concrete invert with vitrified clay liner plates.

IN THE Forest Hill Park section of Cleveland, Ohio, Dugway Brook, an unsightly, sewage-laden creek following a winding course through a municipal playground, has been covered for 1,805½ ft. of its length by a sectional plate arch culvert of corrugated Toncan metal, shop-fabricated and assembled in sections, prior to shipment into the field, to insure an accurate fit of the plates at eight curves in the alignment of the structure. Designed by the Engineering Division of the City of Cleveland, the culvert was installed by WPA labor, using a minimum of mechanical equipment.



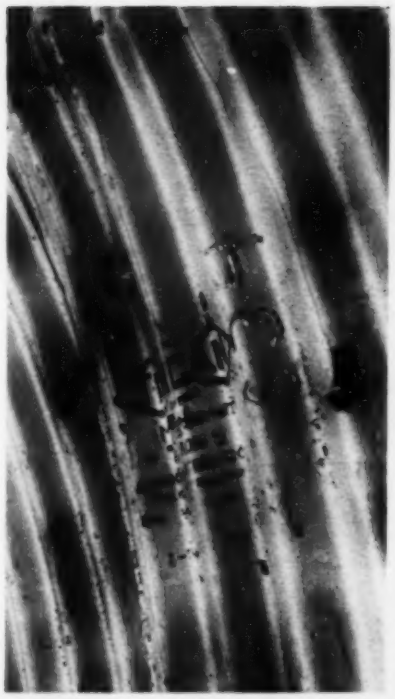
CROSS-SECTION OF CULVERT, showing asphalt-filled channel connection between curved plates and concrete sidewalls.

The culvert has a semicircular cross-section, 17 ft. wide and 9 ft. high, inside dimensions, as shown in the accompanying sketch. A concrete invert, lined with vitrified clay liner plates laid in 1:2 portland cement mortar, is supported by transverse concrete beams on 5-ft. centers. Reinforced concrete sidewalls 8 in. thick extend about 2 ft. above the invert to form abutments for the corrugated metal arch plates which are seated upon and bolted to 6x2½-in. ship channels, anchored to the tops of the concrete walls and filled with asphalt to form a watertight joint. The arch consists of six curved corrugated plates of No. 3 gage (¼ in.) gal-



ASSEMBLY IN SHOP guaranteed accurate fit of corrugated plates at job site.

CURVES to the number of eight occurred in the 1,805½ ft. of culvert, winding through municipal playground.



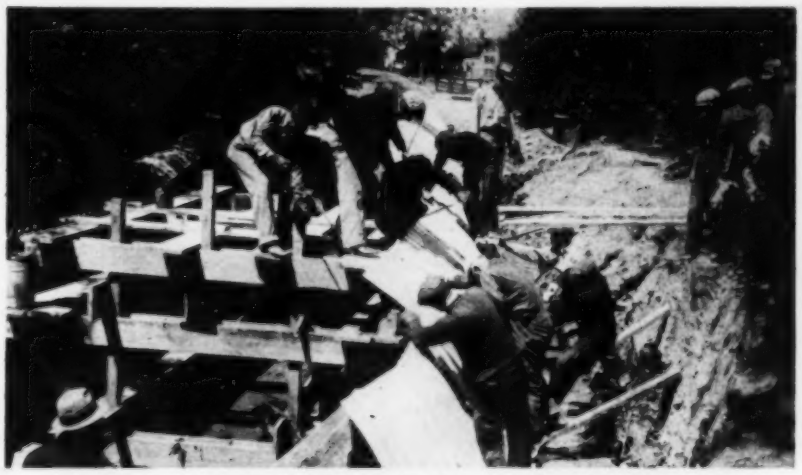
WELDED MARKINGS on corrugated plates insured accurate assembly by WPA workers in field.

vanized metal, with bolted field connections. Corrugations are 1½ in. deep and 6 in. apart between crests.

Fabrication of the corrugated metal for the culvert was done in the Cleveland shops of the Canton Culvert Division of the Republic Steel Co. Here the metal was cut and curved into plates having a maximum width of 12 ft., a circumferential length of 53 in. and a weight not exceeding 600 lb. Plates for the curved sections of the line were accurately shaped by welding.

Because of the eight curves in the alignment of the culvert it was desirable to insure an accurate fit for the metal plates before they were shipped into the field. At the shop, therefore, lengths of line were completely assembled, adjusted for a perfect fit, marked and then knocked down for delivery to the site. On the job the field force had no trouble in fitting and bolting up the "custom-tailored" sections of the metal arch. The project is said to be the first of its kind to employ a sectional plate arch culvert cut and fitted together, in advance, in the shop and designed as a continuous structure without the conventional concrete transition boxes at points of change in alignment.

Erection of the arch plates in the field was done by hand-labor methods, with the aid of a movable wooden scaffold, as illustrated. Each 600-lb. plate was handled by eight men equipped with short hooks inserted into the bolt holes. All field connections are made by bolts; the only welding done was in the shop to form the plates for the curved alignment portions of the culvert. A 3-ft. earth backfill was placed over the completed arch, thus effectively concealing what had formerly been an ugly and unhealthful stream.



WOODEN FALSEWORK aided placing and bolting of plates forming semicircular culvert section.

SHOP WELDING was employed to shape plates at points where alignment changes occurred.

The project was planned and carried out under the supervision of Miles E. Evans, Director of Public Service for the City of Cleveland. For the city's Engineering Division, E. C. Richardson is engineer of sewer design, and S. H. Murdock, engineer of construction.

Trailer Equipped for Patching Pavement

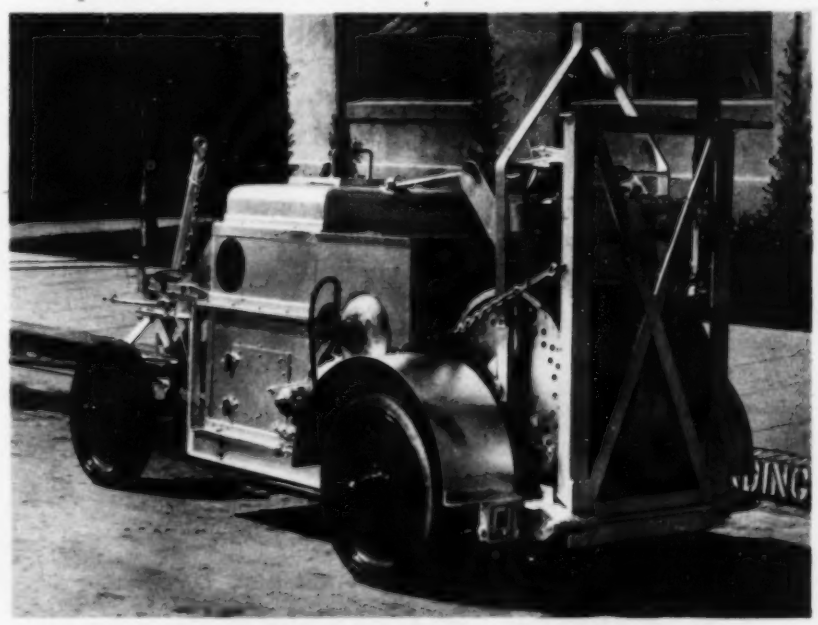
By F. A. RHODES

Director of Public Works, San Diego, Calif.

FIVE CREWS, working continuously, lay approximately 90,000 sq. ft. of patches per month on San Diego's 495 mi. of hard surface pavement. Each crew is equipped with a truck which hauls a combination trailer built in the city's machine shops. This trailer carries a tank for asphalt, a heating unit, a rack for smoothing irons, and one for the hand roller, all set upon an iron frame mounted upon solid rubber tires. The total weight of the unit is 3,800 lb.

The firebox is constructed of 3/16-in. boiler plate; it is lined with asbestos and contains a battery of nine Forster V8 burners hooked up in a series of three burners each. The asphalt kettle, built above the firebox, is also of 3/16-in. plate, and holds approximately half a barrel. The irons slide in over the firebox, underneath the kettle, on grate bars directly over the flame. Irons and asphalt are heated simultaneously. Fuel is contained in two 41-lb. cylinders mounted behind the firebox. Over these tanks is a tool box and behind them is a rack for the hand roller. The roller is held in place by a fabricated tail-gate which, when let down, makes a runway for the roller.

The roller is constructed of 1-in. iron; it is 25 in. in diameter and has a 24-in. face. It weighs approximately 600 lb., fully equipped. The fuel tank and expansion chamber are mounted on the handle of the roller and feed two Forster V7 burners set at the lowest point inside the roller. The journal rests in a steel sleeve bearing, making the unit easily handled by one man.



TRAILER EQUIPMENT includes asphalt tank, liquid gas fuel cylinders, heating unit, rack for smoothing irons and 600-lb. hand roller in rack (at rear).

Both asphalt tank and roller are fired with an industrial gas, delivered to the city in special containers of two sizes. The larger, containing 41 lb., supplies the heating unit. A 10-lb. size goes on the roller. The smaller tanks make no provision for expansion of the gas, so it is necessary to install an expansion chamber on the roller.

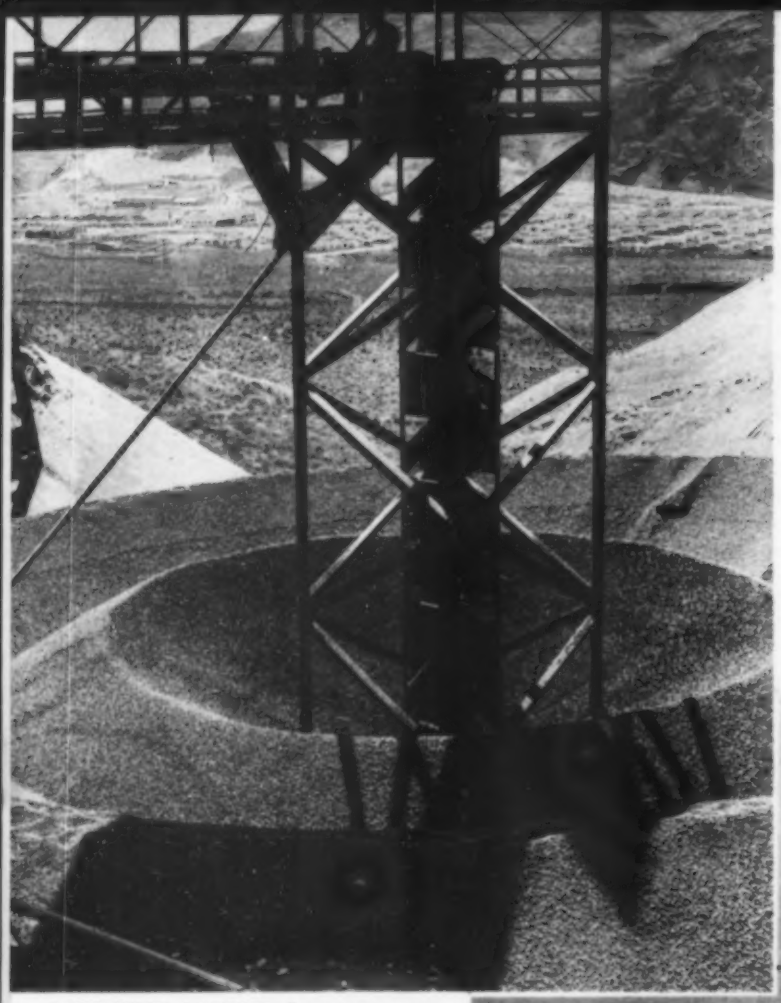
The gas is held in liquid form by a pressure of 80 lb., at 70 deg.F., and when this pressure is released it becomes a vapor, one volume of wet gas expanding into eight volumes of dry. The fuel line runs down the handle to a control valve and into the roller through the journal. Maximum heat development is around 3,500 deg. F. and 10 min. is sufficient to get the roller to working heat.

So far as we can learn, this is the first time this gas has been used for this purpose by anyone. We find it economical, easy and clean to handle, and quick to give the desired heat. One tank of each size will operate the heating unit and roller for 8 hr. The full battery of burners is used until the asphalt is hot. Then they are shut off, three at a time, until but one battery is left to keep the asphalt and irons hot.

Getting Down to

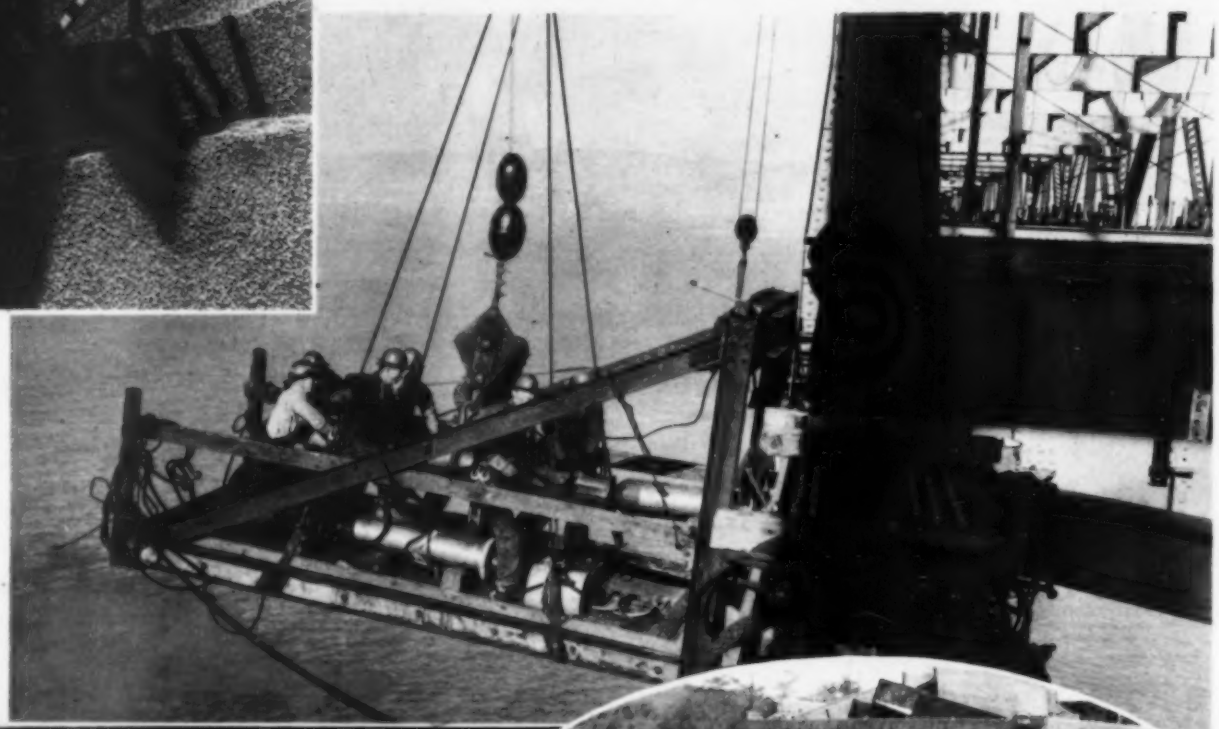
DETAILS

Close-Up Shots of Job Methods and Equipment



LOWERING LADDER drops aggregate into plant storage pile at Grand Coulee dam, preventing degradation and segregation of crushed gravel delivered by belt conveyor from screening and washing plant. Four of these ladders deposit various sizes of aggregates in their respective piles above laminated timber tunnel containing 48-in. belt which carries sand and gravel to central live storage piles supplying east and west mixing plants.

HEAVY RAM *(below)* suspended by hoist line drives last pin in closing operation on 1,400-ft. cantilever span of San Francisco-Oakland Bay bridge. Pin, 3 ft. long and ½ ton in weight, is one of four which connect eyebars of lower chords. Four 500-ton horizontal hydraulic jacks on split steel bent at east end of cantilever bridge, 1,200 ft. from center closure of main span, jockey eyebars into position for driving of pins.



STEEL DECK PLATES of state highway bridge at Franklin, Ohio, are welded to girders, cross beams and stringers of floor system. Truck wheels on plank weight down joint between plates for welding. Note holes in plates for welding to steel members. *Photo, Armco Culvert Manufacturers Assn.*

TWIN-BULLDOZER TEAM *(left)* pushes earth downhill on 750,000-cu.yd. contract of Guy F. Atkinson Co., grading 4.8-mi. section of Angeles Crest highway, near Mt. Wilson, Calif. By working two bulldozers in combination, spillage is reduced and efficiency of earth-moving operation is improved. One Le Tourneau bulldozer at top of slope is working material into pile to be moved by pusher team of similar units.

TRIPLE SPINNING WHEELS *(right)* string wires for 36½-in. cable of Golden Gate bridge, carrying six wires to transfer station at center of main span, where this group of wires is exchanged for six others carried to mid-point by triple wheels from opposite anchorage. Direction of continuous hauling ropes then is reversed, and spinning wheels return to respective anchorages. As each hauling rope carries two sets of spinning wheels, total of 24 wires is strung in each bridge cable at one time, as compared with four wires under former system, by which continuous tramway rope extended from anchorage to anchorage and carried only two single (instead of triple) spinning wheels. By use of split (or double) tramway on Golden Gate bridge, with two sets of triple spinning wheels on each half of system, wire for total of twelve strands is unwound from twelve reels, six at each anchorage. Wires are sprayed with distinctive colors to assist adjusters in placing them in proper guides and positions at control points along footwalk and on towers.

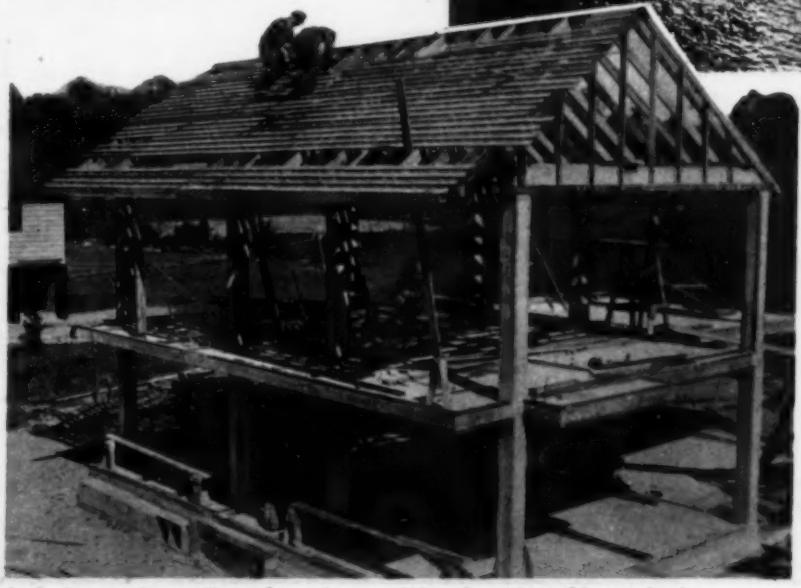
HINGED SIDE of body on Dodge hydraulic dump truck is lowered to facilitate loading and unloading. By removing two pins, hinged sides and tail gate may be lowered to form wide platform body.

WANTED—

Photos of Details

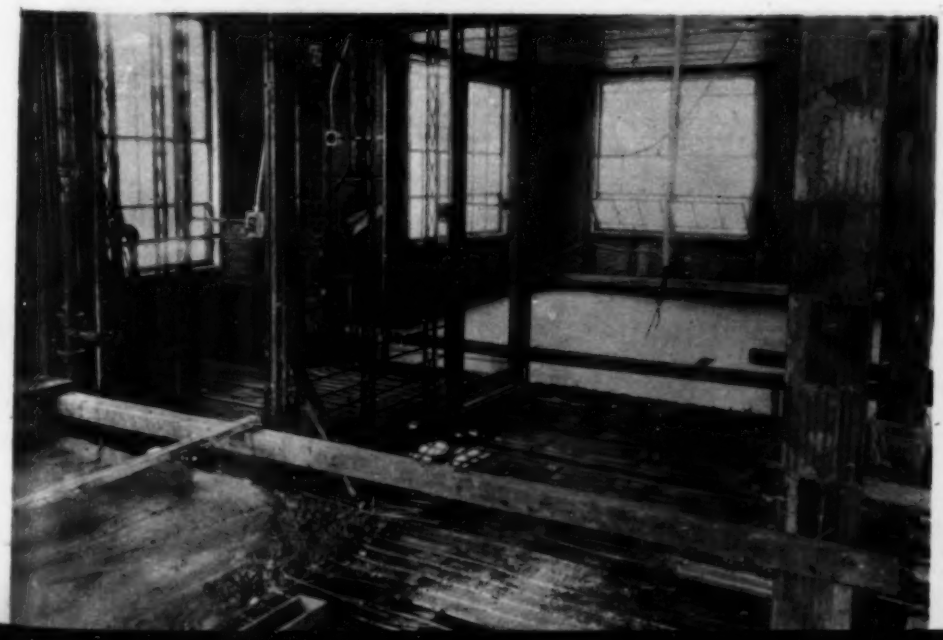
The Editor of Construction Methods wants photographs or sketches illustrating interesting DETAILS of method or equipment and will pay for those he finds acceptable for publication.

Hasn't your job produced some DETAIL that might be illustrated on this page? Send along a picture of it; we'll return it promptly if we can't use it.

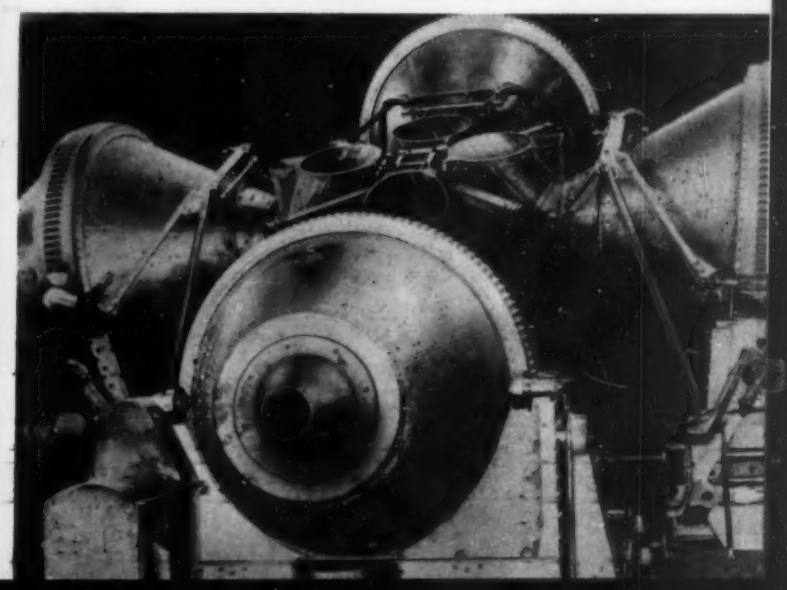


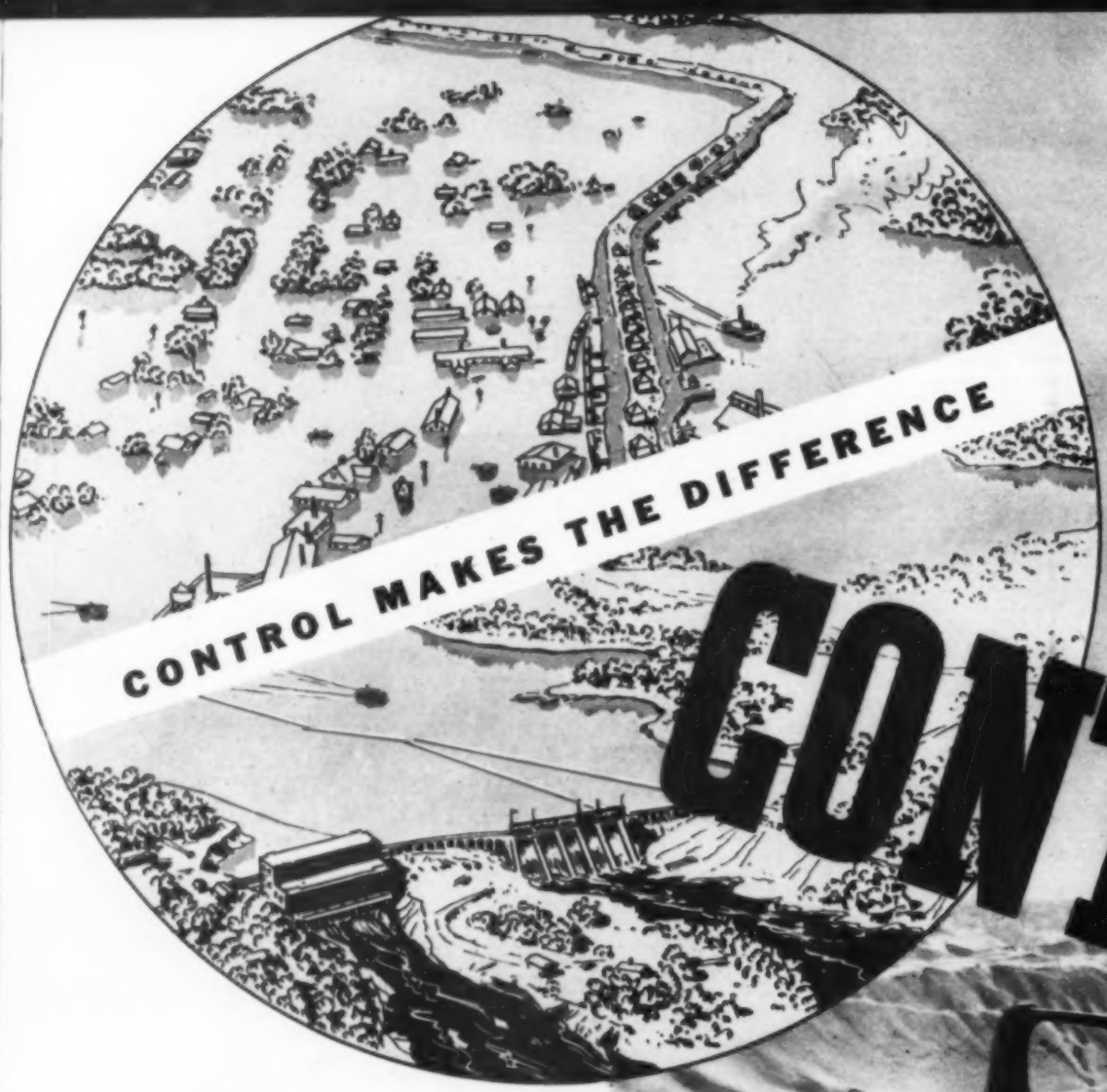
REINFORCED CONCRETE FRAME *(left)* with concrete floor slabs, is type of design followed by Harold S. Curren, contractor, in building by mass production methods group of 43 six-room, two-story homes selling for $5,900, complete with land and garage, in development by Homindustries, Inc., on outskirts of Rochester, N. Y. Framework comprises eight 10x10-in. concrete columns on spread footings, concrete floor girders and 6-in. concrete floors. Second-floor ceiling joists are hung from top system of concrete girders on which rafters rest. Concrete placement is made in five pours, as follows: (1) basement walls; (2) garage floor; (3) first-floor slab; (4) second-floor slab, beams, garage roof and supporting columns; (5) second-story columns and top beams. Wallboard ceiling finish is laid directly on steel slab forms before concrete is poured and adheres to under surface.

OPEN-WEB JOISTS AND STUDS *(below)* of Kalman manufacture are used in floors, exterior walls and partitions of new office building for blast furnace department of Lackawanna plant, Bethlehem Steel Co., Lackawanna, N. Y. Brick veneer of exterior walls is placed against Steeltex backing (waterproof paper reinforced with wire mesh) wired to flanges of 4-in. studs incorporated in these walls. Truss joists in floor rest on exterior-wall studs. Interior partitions utilize 3-in. studs, which carry no load. Steel lath is wired to flanges of studs, both in exterior walls and partitions, and is covered with two coats of plaster. Exterior walls are insulated with mineral wool placed in space between studs. Steel-truss floor joists are covered with 4-lb. 3/8-in. rib lath on which is placed 2½-in. slab of 1:2:4 gravel concrete. Offices are completely air conditioned and heated by mechanical unit comprising washer, filter, humidifier, fan and heating coil. Space between floor joists provides duct for fresh, warm air. Interior partitions act as return ducts. Similar construction is specified in $50,000 office building for new strip mill at Lackawanna plant.



INCOME AND OUTGO *(below)* pass through same throats in this battery of four 84-S Smith tilting mixers, designed for front-end charging (as well as discharging) by engineers of T. L. Smith Co. and used by Frederick Snare Corp. at Tygart River dam, Grafton, W. Va. Mixers are set up in compact radial arrangement for successive straight-line charging from turn head of one batching hopper. Displaced air escapes through opening in outer end of drum. Drum revolves in virtually horizontal position, giving effective mixing action and minimum end thrust on rollers. Mixers discharge into central hopper.





CONTROL

Water power ... *out of control* ... can be one of the most destructive forces known to man. Homes, property, human life—all are swept away with fiendish abandon. But *under control* ... water power brings the cheery comfort of heat and light to millions. CONTROL MAKES THE DIFFERENCE.

(*Right*) Control makes a difference in tractors, too. Note the absolute freedom of slippage, as shown by tracks in the sand—the result of BALANCE. This Model "K-O" and bulldozer keep fine, shifting sand from blowing back into California's All-American Canal.

Controlled Ignition
ELIMINATES THESE COSTLY PROFIT ROBBERS:

- **High Tension Rings**
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ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition PERMITS PROPER BALANCE BETWEEN POWER AND WEIGHT

ALLIS-CHALMERS Oil Tractors are "trained down" to fighting weight. Light-footed . . . responsive . . . quick-acting—a pleasure to operate, a revelation in performance. The exclusive *Controlled Ignition* principle does away with the extra dead weight which cuts down speed, wastes power, and slows up production. Such familiar penalties of high compression ignition as heavy, unbalanced parts, special heavy construction and auxiliary starting devices are no longer necessary. Once again Allis-Chalmers leads the way—this time to give you maximum economy on Diesel fuel oil, combined with simplicity, smoothness, better balance, greater flexibility, easier servicing, instant starting, lower first cost. Branch house and dealer service everywhere. Ask the A-C dealer.

• • •

CONTROLLED IGNITION OIL ENGINES—INCLUDING FUEL PUMPS AND INJECTORS—ARE OF ALLIS-CHALMERS OWN DESIGN

CONTROLLED *Instant* STARTING

Easy starting, regardless of weather. Crank or self-starter. No auxiliary starting motor.

CONTROLLED INJECTION OF FUEL

Diesel fuel oil is sprayed (not squirted) into the combustion chamber at 60° before top dead center. Fuel pump of A-C design . . . measures charge of fuel accurately, regardless of load or throttle setting. Simplest, easiest to service fuel pump built. Controlled pressure in fuel lines — no hammer-like blows from pressure changes.

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Specially designed injection system maintains proper ratio for efficient combustion at ALL engine speeds. No excess of air at idle speeds to lower exhaust temperatures at the expense of power.

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Controlled spark ignition at exactly the proper point for complete, efficient combustion. No chance of power-wasting pre-ignition. High compression pressures with the resulting destructive forces are eliminated. No need of special rings, or heavy, unbalanced parts. No split-hair tolerances.

Again ALLIS-CHALMERS LEADS THE WAY

S *Controlled Ignition* OIL TRACTORS

EIGHTH OF A SERIES OF ARTICLES

Planning and Plant for HEAVY CONSTRUCTION

. . . 8 . . .

Cofferdam Design and Construction, Including Rock-Filled Crib, Concrete Wall, Steel Sheetpile and Cellular Steel Types.

Principles and Practices of Job Layout and Selection and Use of Equipment for Large Dams and Appurtenant Works

By ADOLPH J. ACKERMAN and CHARLES H. LOCHER
Construction Plant Engineer *Construction Consultant*
TENNESSEE-VALLEY AUTHORITY, KNOXVILLE, TENN.

EACH LOCAL CONDITION will have its own peculiar problems and a judicious selection of the most economical type of crib construction can develop important savings in first cost. The accompanying table shows principal dimensions of some of the most important crib cofferdams which have been constructed in the past.

Rock-Filled Crib—The most recent of this group is the Bonneville cofferdam on the Columbia River which was designed for an unprecedented height of 63 ft., the average height being 55 to 60 ft. A general view of this cofferdam is shown in Fig. 1; particular note should be taken of the excellent fit obtained between the adjacent cribs due to the good sounding of the river bed and consequent accurate spotting of the cribs. Fig. 2 shows the base of one of the cribs built to conform to the irregularities of the river bed. The depth of water in which the cribs were sunk ranged from 30 to 50 ft., and the current averaged 7 mi. per hour.

In the case of the Bonneville cofferdam the contractor was relieved of assuming responsibility for the major cofferdam hazards for which he must usually include a rather high contingency reserve in his bid. The cofferdam was first studied on a model, and careful observations were made of various features, such as expected division of flow of the river during the first and second stages, direction of current and velocity, and scour on the bottom. The general design features are shown in Fig. 3. The cribs contained weight pockets, which were filled with rock to sink them, and chambers lined with tongue-and-groove sheathing which were filled with impervious earth. Divers were employed to make a careful check of the contact at the base. In floating the cribs into place, control of their position was maintained by a system of cables which at times carried a load of 175 tons. This control system was quite ingenious, and its layout took full account of the shape of each crib and the proper point of application of holding lines so that the crib remained in a stable position at all times.

A protecting face of steel sheet piling was driven so as to rest against the river side of the cofferdam and extend sufficiently down into the bottom to develop an effective seepage cut-off. An interesting feature of this steel facing was the presence of a series of T-piles on 12-ft. centers. The object of these special T's was to permit the driving of a separate loop of piling along any point where unusual leakage or a break in the interlock or some other condition required the driving of a second line of piling. The T's provided a means for connecting this line to the main wall so as to form a continuous and effective water stop. This precaution proved very much worth while, as it became necessary to drive two or three such loops.

A further point of interest in the

Fig. 1 . . . ROCK-FILLED CRIB COFFERDAM at Bonneville dam on Columbia River, built to record height of 63 ft.

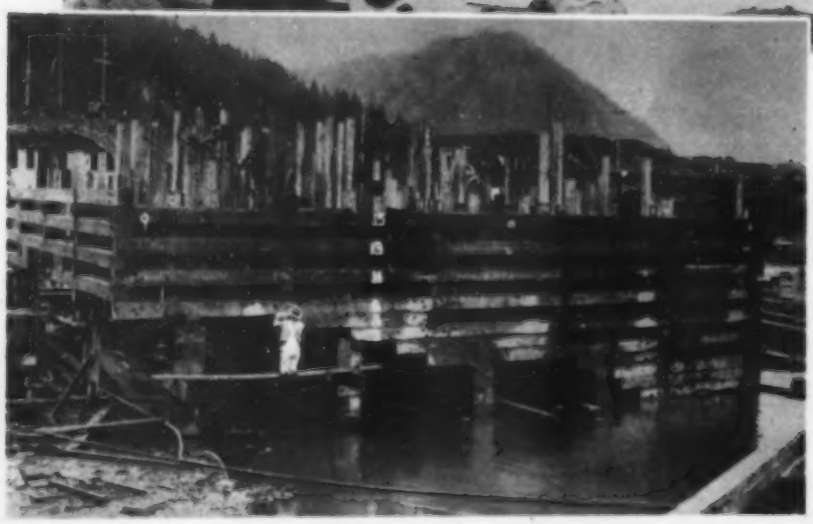


Fig. 2 . . . SHAPED BASE of cofferdam crib at Bonneville conforms accurately to contour of river bed.

Bonneville cofferdam is that the cribs had an average deflection of 12 to 18 in. at the top after unwatering.

Concrete Wall Serving as Cofferdam—Fig. 4 shows an interesting application of mass concrete in an unreinforced gravity wall for temporary service as a cofferdam at Norris dam. This was considered most economical from the standpoint that only labor and materials would be involved in its construction, since the mixing and placing plant was already available and at the time was not needed for other service. This type of cofferdam, also, has the special advantage of conserving on base width where this is needed to develop ample channel capacity for the diverted river. The wall was later blasted with light shots and removed by ordinary excavating methods.

Steel Sheet-Pile Cofferdams—The detailed features of various types of sheetpiling and driving equipment will be discussed in a later chapter. The simplest type of sheetpile cofferdam consists of an earth fill with a single wall through the center, the piling serving the dual purpose of developing a watertight cut-off and stabilizing the foundation and earth fill against destructive movements of water through such material. Special precautions are, of course, essential in the driving of such a wall to prevent jumping the interlock, as occurred in the case shown in Fig. 5. Single walls of piling also are occasionally used to face rock-filled or other types of crib cofferdams for the purpose of developing a protective armor or reducing seepage. In considering such a cut-off it is important to balance its cost against the increased cost of pumping if a greater leakage is permissible.

DIMENSIONS OF IMPORTANT COFFERDAM CRIBS*

Item	Rock Island	Beauharnais	Dnieperstroy	Bonneville	Conowingo
1. Crib Pocket Size	8 x 8 ft.	10 x 10 ft.	7 to 9.5 ft.	12 x 12 ft.	8 x 8 ft.
2. Maximum Width of Crib	80 ft.	20 ft.	61 ft.	60 ft.	30 ft. (54 ft. including puddle chamber)
3. Maximum Height of Crib	58 ft.	22 ft.	42 ft.	63 ft.	30 ft.
4. Vertical Timbers	12 x 12 ft. in all outside corners	Bolted in outside corners	Scattering	8x12-in. bolted all outside corners of lower portion	Scattering
5. Principal Timber Sizes	12 x 12 in.	8 x 8 in.	9 x 9 in.	10 x 12 in. 12 x 12 in.	10 x 12 in.
6. Timber Lengths	16 to 32 ft.	10 to 20 ft.	.....	24 to 36 ft.	12, 16, 20, 24 ft.
7. Timber Grade	Douglas Fir No. 1 & 2	B. C. Fir	.....	Douglas Fir No. 2 Common	Douglas Fir

** This table includes data originally compiled by H. G. Gerdes.*

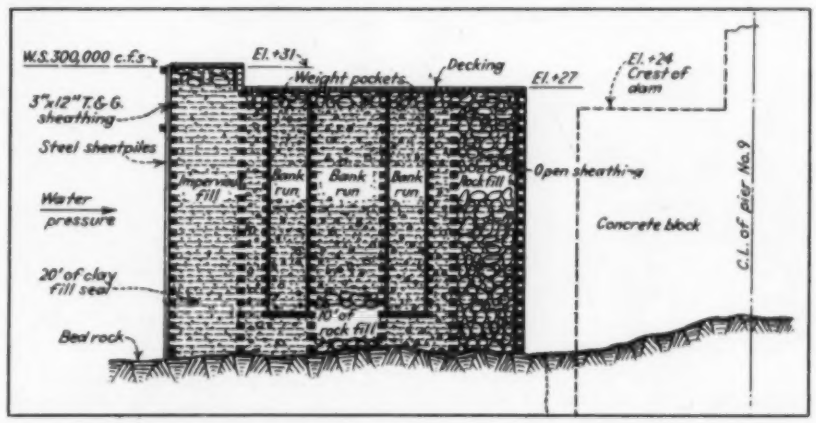


Fig. 3 . . . TYPICAL DETAILS of cofferdam crib design for Bonneville dam, showing rock-filled weight pockets and impervious fill.

In the construction of locks and dams on a pervious foundation on the upper Mississippi River and elsewhere, a double wall of sheetpiling with an earth fill between the walls was used by a number of constructors, as shown in Fig. 6. This type depends on a generous supply of horizontal tierods as well as cantilever strength of the piling to keep the two walls tied together. There are a number of modifications of this general type, which include the use of walers on the outside and larger tierods to develop a more economical design.

A novel type was developed by Lazarus White, of Spencer, White & Prentis, Inc., on the Mississippi River after making extensive studies of the seepage problems on models. It was found more economical to use only a single wall of steel piling on the river-side and employ timber piles with walers and timber sheathing on the inside for the purpose of retaining the sand fill. This gave much better seepage characteristics and permitted the fill between the walls to drain out more readily, instead of remaining in a saturated condition. It was also found that a careful location of the bottom of the outer cut-off wall, together with the proper slope of fill against the inside wall and a particular position of a trench at the toe of this fill, would cause all of the seepage to accumulate in the trench. This trench was located a number of feet

Fig. 4 . . . DIVERTED RIVER, in foreground, at Norris dam, showing temporary concrete retaining wall of massive gravity section serving as cofferdam.

below the ultimate working level within the cofferdam area and connected to a sump from which all leakage was pumped out. By this method a dry cofferdam area was developed without the use of well points or other special devices.

Cellular Sheet-Pile Cofferdam—The cellular cofferdam is probably the most difficult and expensive to construct, but is frequently the most satisfactory type and of late has been employed on quite a number of projects. For large cofferdam jobs the advance driving of a small experimental cell, as shown in Fig. 7, is a good investment. By driving certain piles at different intensities and number of blows after reaching rock and then digging out inside of the cell to gain access to the bottom, observations can be made of penetration and deformation of piling which will serve as a valuable guide in the construction of the main cofferdam. Pulling the piling in the experimental cell will furnish much valuable advance information on the problem of pulling the cofferdam and permit making adequate preparations and development of necessary equipment for this work. Such a test cell, before and after being partly pulled up, offers ideal means for obtaining reliable data on ground water flow, leakage through the cut-off wall, and an estimate of pumping requirements for the main cofferdam. (See Fig. 8.)

Some years ago the tendency was towards employing the diaphragm type with connecting arcs, but more recently this has been replaced by a line of cylindrical cells which are connected by short arcs. The chief advantage ot the circular type is that each cell is independently stable and this permits construction at various points. The filling and, later, the removal, of each cell can be performed at the most convenient time and independently of the adjacent one, which is not the case with the diaphragm type, where 8 or 10 cells must be filled or emptied simultaneously and in stages to prevent distortion of the diaphragms. While for the lower cofferdams less steel is required with diaphragm types, this principle does not hold true in the case of high ones, of 50 to 55 ft. Considering the difficulties of construction and removal with the diaphragm type it is, in the majority of cases, more economical to use additional steel and construct the circular type.

Piledriving Templet—It is usually necessary with the diaphragm type to leave most of the timber framing, which serves as a temporary support and templet for the steel, in place for a group of 10 or 12 cells until they are filled to a point of stability, and this again is an uneconomical use of materials as compared with the circular type. This was demonstrated to an unusual degree at Pickwick Landing dam where James E. Walters devised a new type of steel templet consisting of pipes and a cable-bracing system as shown in Fig. 9. This templet was 58 ft. in diameter and 20 ft. high and was surprisingly rigid and easy to handle. It was equipped with steel pipe spuds, spaced at four points on the templet; these were lowered down to the river bottom to serve as supports for the templet.

The templet itself was located at the right distance from the adjacent

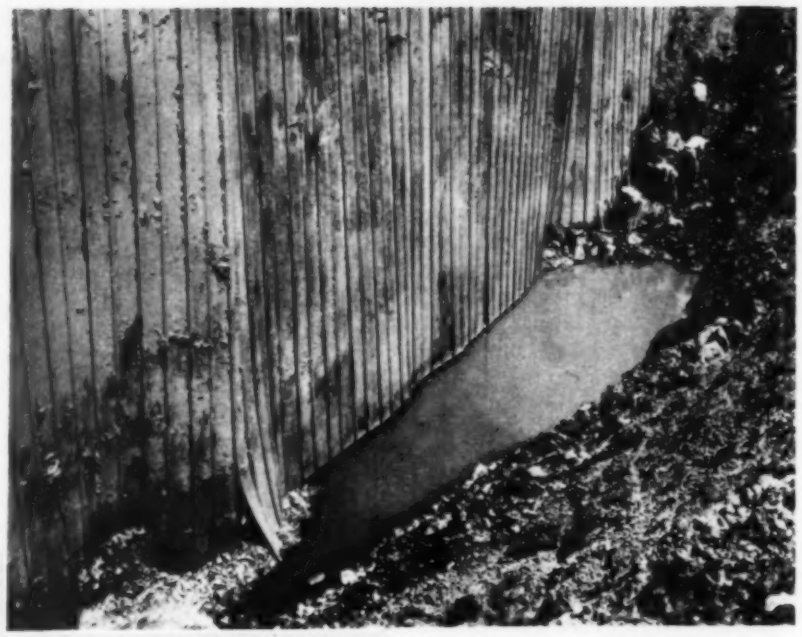


Fig. 5 . . . JUMPED INTERLOCK in single line sheet-pile cutoff.

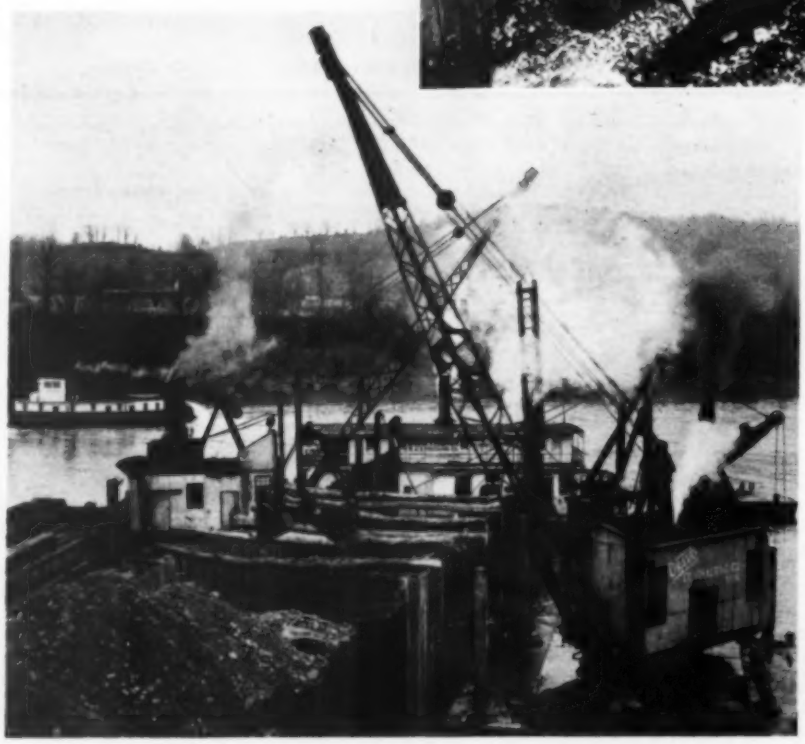


Fig. 6 . . . STEEL SHEETPILE COFFERDAM for Winfield locks on Kanawha River in West Virginia consists of double row of piling tied together with tierods and filled with gravel. Timber poles protect tierods during filling.

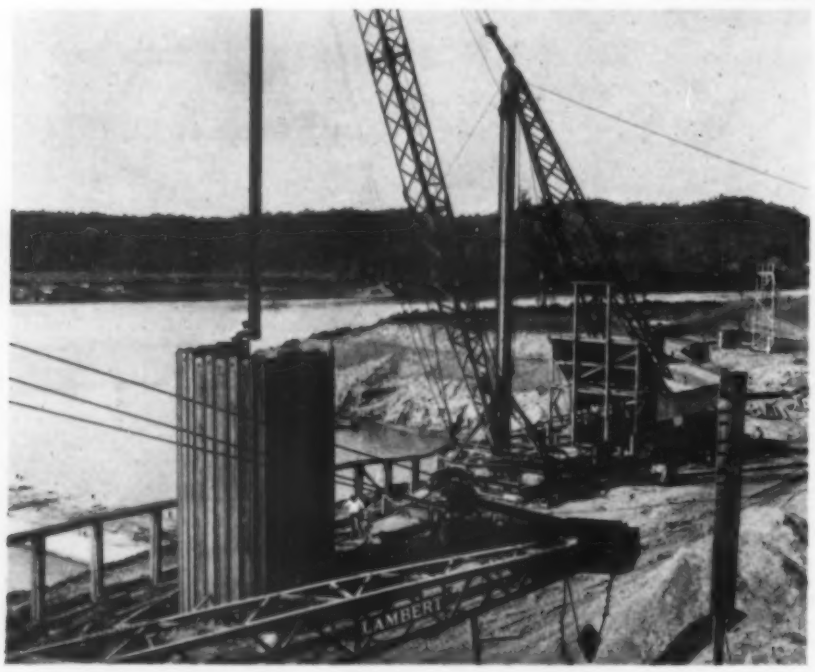


Fig. 7 . . . EXPERIMENTAL CELL of steel sheetpiling driven at Pickwick Landing dam to determine hammer blows, penetration into rock, power required to extract under different driving conditions and rate of seepage.

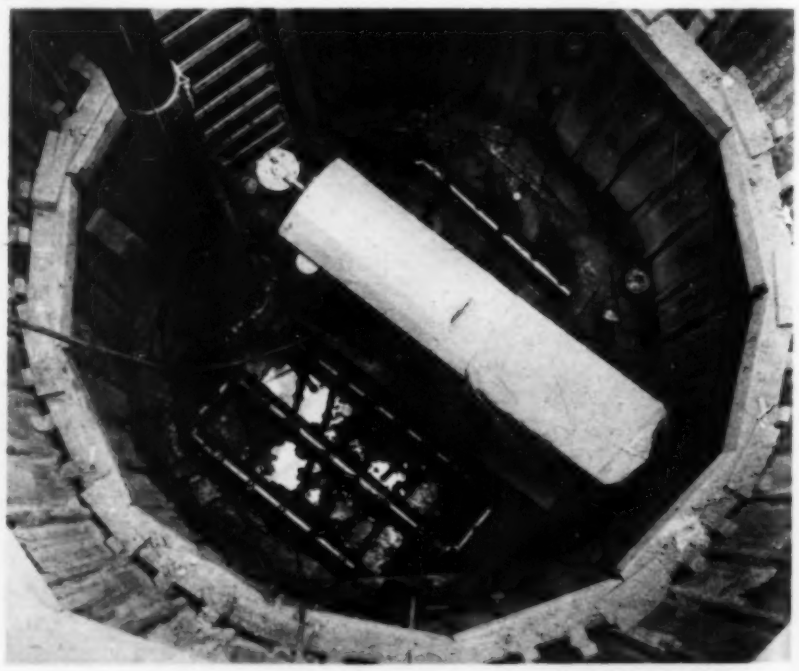


Fig. 8 . . . INTERIOR of experimental cell of sheetpiling showing arrangement of well points and covered pump for testing various conditions of ground-water seepage. Sheetpiling partly extracted above rock level.

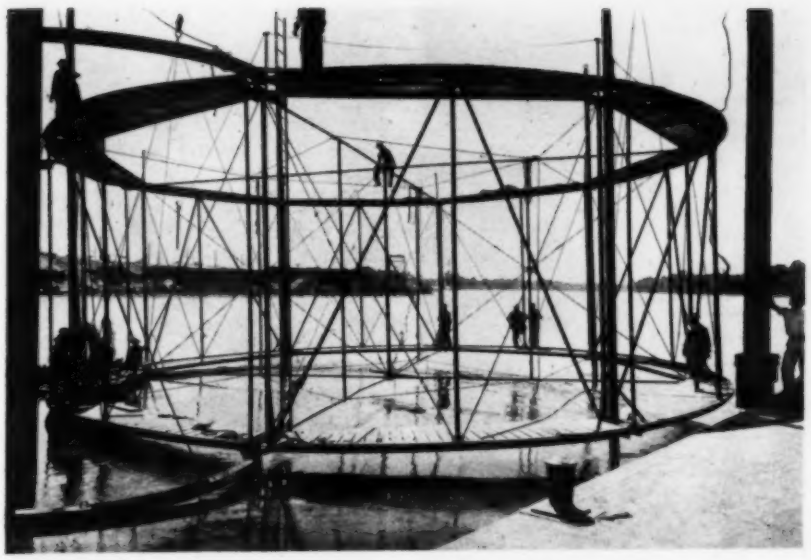


Fig. 9 . . . STEEL TEMPLET, 58 ft. in diameter and 20 ft. high, supported by four pipe spuds, to guide driving of steel sheetpiles for cells at Pickwick Landing cofferdam.

cell by means of short spacer struts. The two walkways shown in the illustration were particularly handy for the pile-driving crew in gaining access to important points along the cells for guiding the piling during the assembly. The spacing of the piles was carefully marked on both the top and bottom walkways to indicate readily how the assembly was progressing and assure proper fit of the final pile.

With this system the templet was reused immediately after the cell was driven, and this was the major element of economy. It took approximately 4 hr. to reset the templet, and the total time required for a templet setting, assembly of sheetpiling and driving through a 10- to 15-ft. layer of gravel to rock required an average of 18.33 hr. per cell.

Pickwick Cofferdam—The Pickwick cofferdam, shown in Figs. 10 and 11, consisted of 26 cells 59 ft. in diameter and 61 ft. 8 in. center-to-center spacing. The piling was 15-in., 38.8-lb. per lineal foot, Section SP 6 flat-web sheetpiling. While in the design of these cells the interlock strength was limited to 9,000 lb. per lineal inch, the piling actually developed under a test a breaking strength in the interlock of 20,000 to 30,000 lb. per lineal inch. The piling was driven by means of two 8-ton, 110-ft. boom skid derricks, mounted on barges, and two 9-B-3 McKiernan-Terry hammers, delivering 145 strokes per minute. The entire cofferdam of 26 cells was driven within 28 days, including holidays.

A special consideration in the design of this cofferdam was the use of sufficient piles in the short connecting arcs. Ten piles were used at each side and these were sufficient to adjust themselves as they were driven to rock and take up irregularities in parallel alignment between the two adjacent cells. Another important feature of this cofferdam is the fact that not all piling is at the same level at the top. For economy in steel the top of the outer wall extends 5 ft. above the inner wall and acts as a cantilever; the cross walls are shorter than both walls. The most important principle in driving such a sheetpile cofferdam is to *keep all piling vertical at all times*. Where it is necessary to drive timber piling and construct suitable templets to hold the piling during assembly, it is, of course, advisable to select the equipment accordingly to serve both the timber and steel piling.

It should be noted that the Pickwick system, with the simple type of portable templet, cannot be used under high river velocities unless a more rigid type of templet is employed. When it comes to final closures in a channel it is customary, first, to divert the river before the last few cells are placed, either by means of an earth fill or rock fill or cribs because, as a rule, the open water is too swift to permit satisfactory assembly of the cells.

Sandbagging—It is a tradition that the big floods come down the river when a dam is being built on it. If the cofferdams are high enough for ordinary floods it is likely that the water will come very near the point of overtopping, and when this appears imminent there is feverish activity needed at all points to pile up sand bags to hold back the last foot or two of the flood rise. (See Fig. 12.) For such cases a generous supply of bags, say 5,000 or 10,000, available on a moment's notice, is an essential part of a fully equipped cofferdam layout.

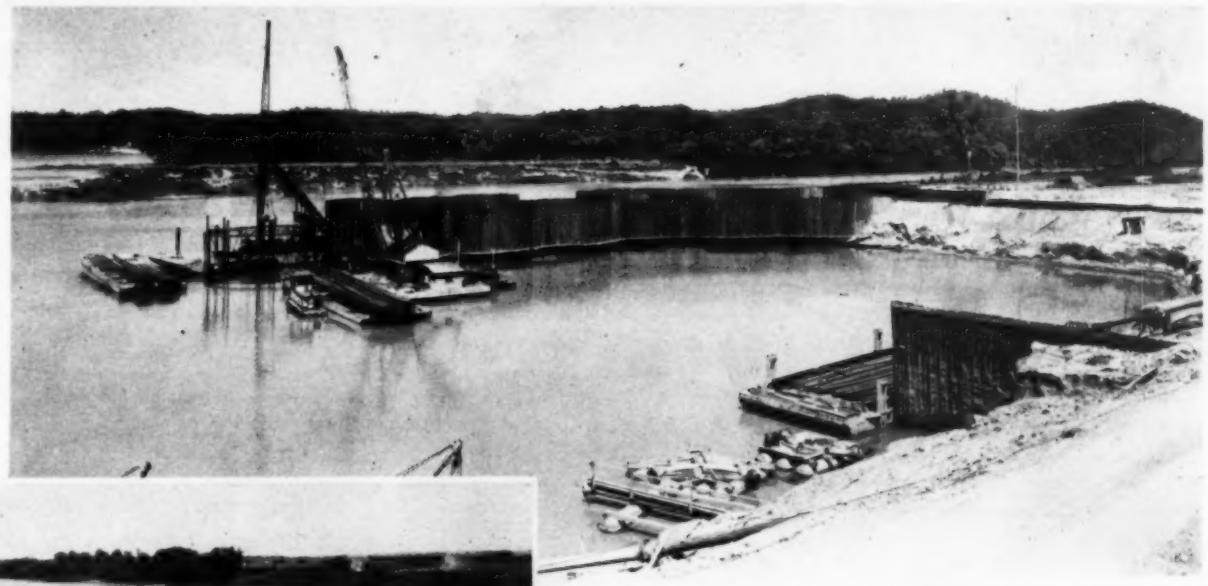


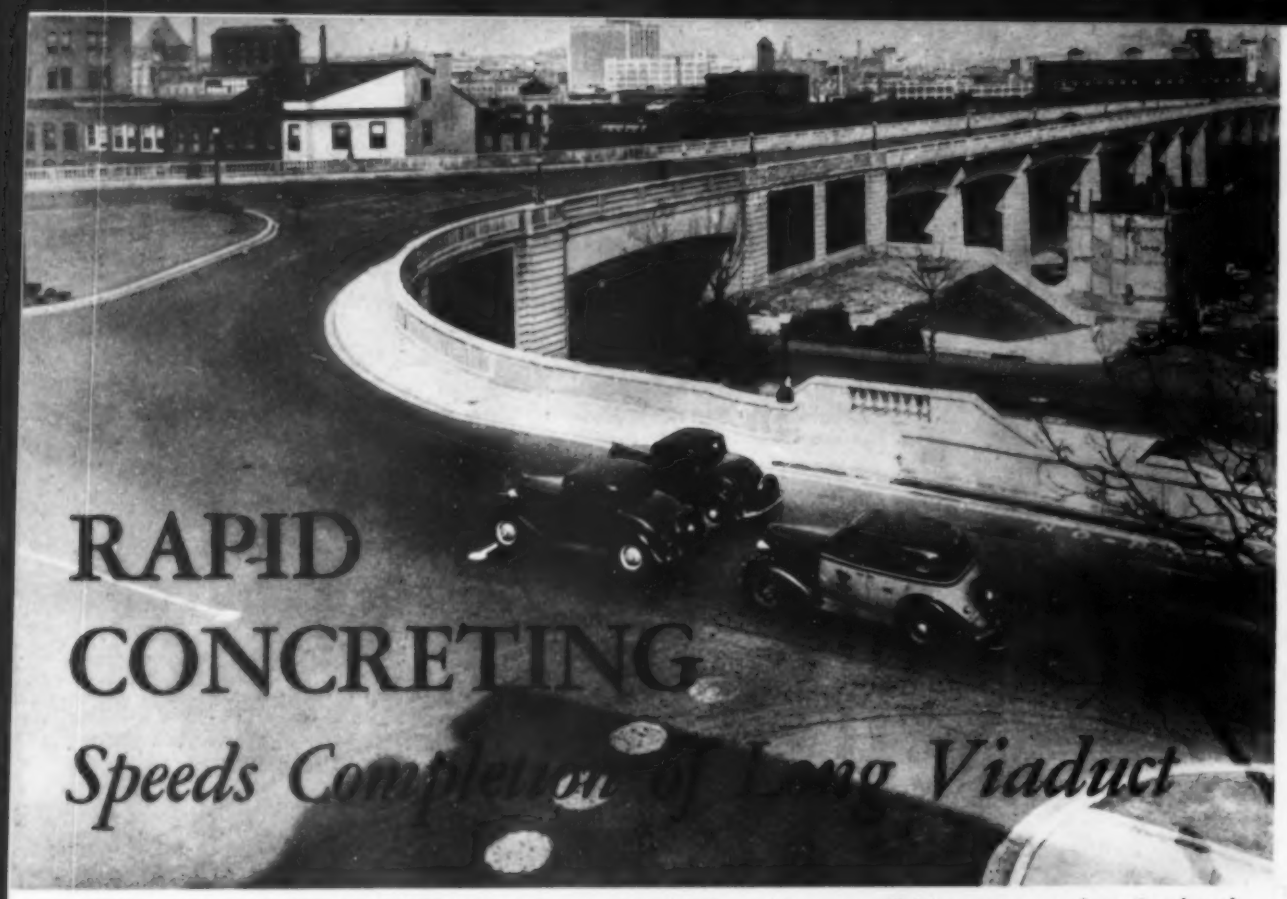
Fig. 10 . . . CELLULAR COFFERDAM *(above)* 55 ft. high at Pickwick Landing dam, showing, at left, circular templet around which cells are assembled before driving.

Fig. 11 . . . ALMOST COMPLETED Pickwick cofferdam. Dredge is pumping sand and gravel fill into cells. Sheetpiling is 5 ft. higher for outside walls, acting as cantilever, except at notch for flood gates at right end.

❖

NEXT MONTH—Chapter 9 of the series on "Heavy Construction," by A. J. Ackerman and Charles H. Locher, to appear in the August issue, will deal with "Diversion of Rivers and Making Final Closures."

Fig. 12 . . . SAND BAGS are rushed to place to hold back flood threatening to overtop cofferdam.



RAPID CONCRETING Speeds Completion of Long Viaduct

STEEL AND CONCRETE VIADUCT 2,200 ft. long carries vehicular traffic over ten Baltimore streets and a railroad yard.

A FORM SYSTEM planned to facilitate stripping and erection, plus rapid development of compressive strength in concrete deck slab made with high-early-strength cement, enabled the George A. Fuller Co., of New York and Washington, contractor, to rush construction of the Orleans St. viaduct in downtown Baltimore under the supervision of the Maryland State Roads Commission from plans prepared by the city's Department of Public Works. Placement in a few hours of large volumes of concrete delivered by truck mixers from a commercial plant gave further impetus to the speed of construction. Employing a single 6-hr. shift 5 days each week, the contracto completed the 2,200-ft. viaduct, involving 18,000 cu. yd. of concrete and 4,900 tons of structural steel, in an actual working period of 9 months.

Features of Viaduct—Crossing ten streets in the most congested section of the city, the Orleans St. viaduct provides ½ mi. of elevated express roadway for through traffic in an east and west direction. Because of its value both to local and to through traffic, the cost of the viaduct, amounting to almost $1,000,000, was met by a combination of city, state and federal funds, with the further assistance of a grant from PWA.

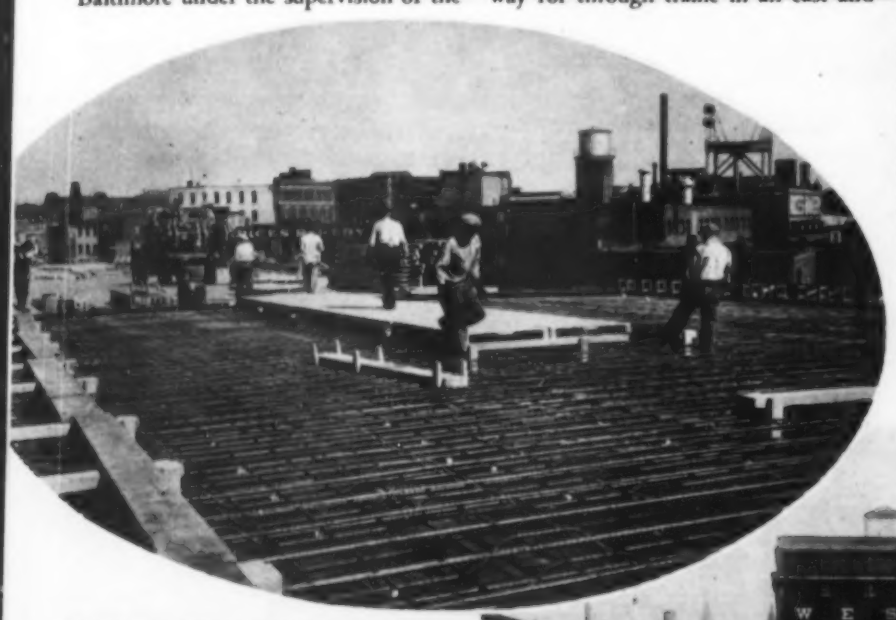
In design, the main portion of the viaduct consists of seventeen steel deck-girder spans from 67 to 110 ft. long. These spans are made up of four parallel plate girders supported by cross girders resting on two-column concrete piers. In addition, the 2,200-ft. length of the viaduct includes one girder span about 80 ft. long inclosed by concrete retaining walls. The east and west abutments and a section between Hillen and High Sts. are earth-filled inside retaining walls. Foundations in general are spread footings on sand and gravel. To give the structure architectural unity, the cross girders are incased in concrete with arched soffits and the steel fascia girders are covered with concrete on their exterior faces.

With the exception of riveted plate arch soffits under the I-section floor beams, the deck framing presents no variations from ordinary design. On top of the floor beams and stringers, the contractor placed an 8-in. reinforced-concrete deck which later was paved (across the 54-ft. width of clear roadway) with a 3-in. sheet-asphalt surface. On both sides the roadway is flanked by reinforced-concrete sidewalks about 6 ft. wide carried on cantilevered brackets.

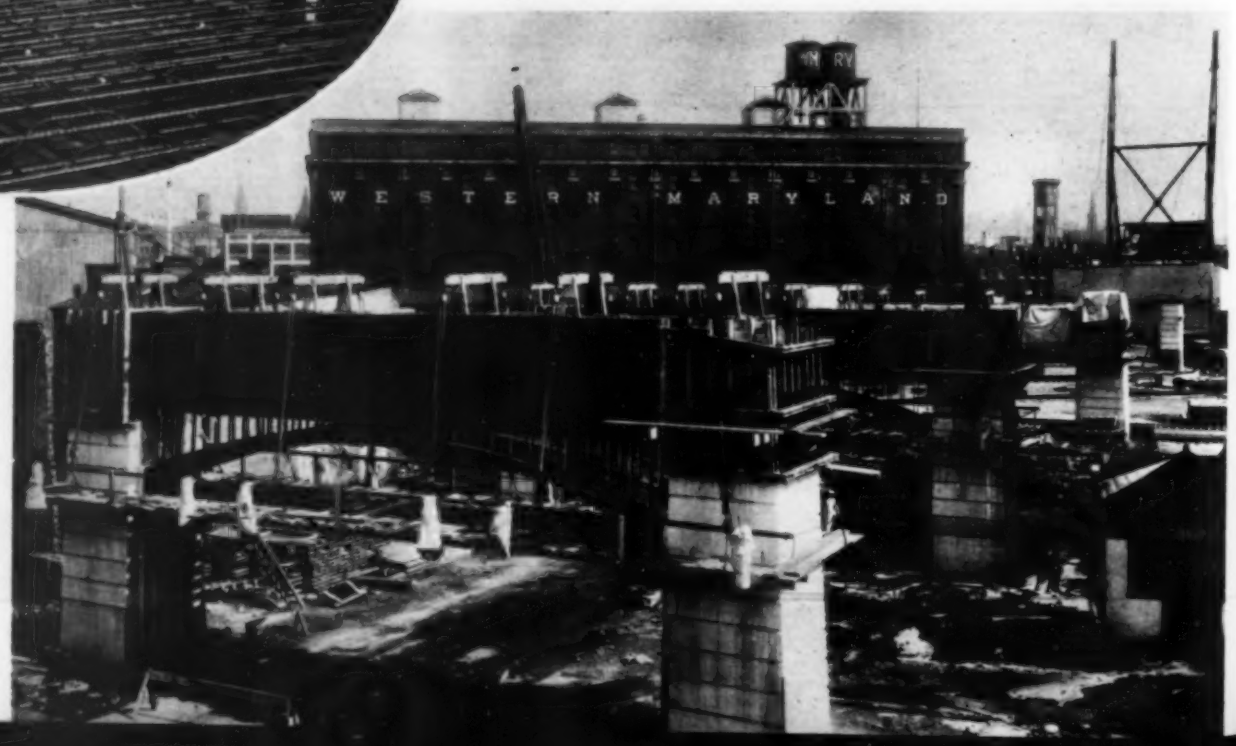
Construction Operations—Concrete for the foundations and lower lifts of the piers and foundation walls was placed directly from truck mixers by chutes. Cranes and roller-gate buckets placed the concrete in the higher lifts Sectional wooden panel forms were used throughout for structures above ground level. When chuting concrete into foundations, the contractor placed as much as 400 cu.yd. in 6 hr.

In erecting cap girders on the two-column piers, the American Bridge Co., steel subcontractor, used two crawler cranes which operated in unison when raising and placing the girders. Longitudinal plate girders and floor steel were erected by a deck traveler consisting of two stiff-leg derricks with structural cross-bracing between the masts. The derricks were driven by a pair of hoist engines mounted on the chassis of the traveler between the backlegs.

Deck Slabs—Deck slab construction started at the east end of the structure and proceeded span by span to the west abutment. Form erection was kept three spans in advance of concreting. The forms consisted of wood panels supported on timber joists which were suspended in wire hangers from the top flanges of the stringers and longitudinal girders. Because of a continual variation in the lengths of the panels,



CART RUNWAYS *(left)* for delivering deck concrete from truck mixers rest on short-legged horses.



ARCH FORMS *(right)* for concrete incasement of cross girders hang by suspender rods from steel members. Two-boom derrick traveler on abutment in background places girders and floor system.

additional carpentry work was required in cutting and rebuilding the sectional wooden forms. Form panels were built in a yard on the ground under the bridge.

Concrete meeting the Class A specification of the State Roads Commission was placed in the deck slab and

W. W. KLINE directs construction operations for George A. Fuller Co., general contractor.

in practically all other parts of the viaduct. This mixture corresponds to volume proportions of about 1:2:4. During the hot summer weather the concrete in the 8-in. reinforced deck slab often acquired a compressive strength of 2,000 to 2,500 lb. per square inch, sufficient to permit form stripping, in 44 hr. The same concrete frequently reached in 68 hr. the 3,000-lb. strength required to permit truck haulage of concrete to adjacent slabs.

Concrete was distributed from the truck mixers in 6-cu.ft. carts which traveled on portable wooden runways supported by short-legged timber horses resting on deck forms. By this method, the contractor placed as much as 320

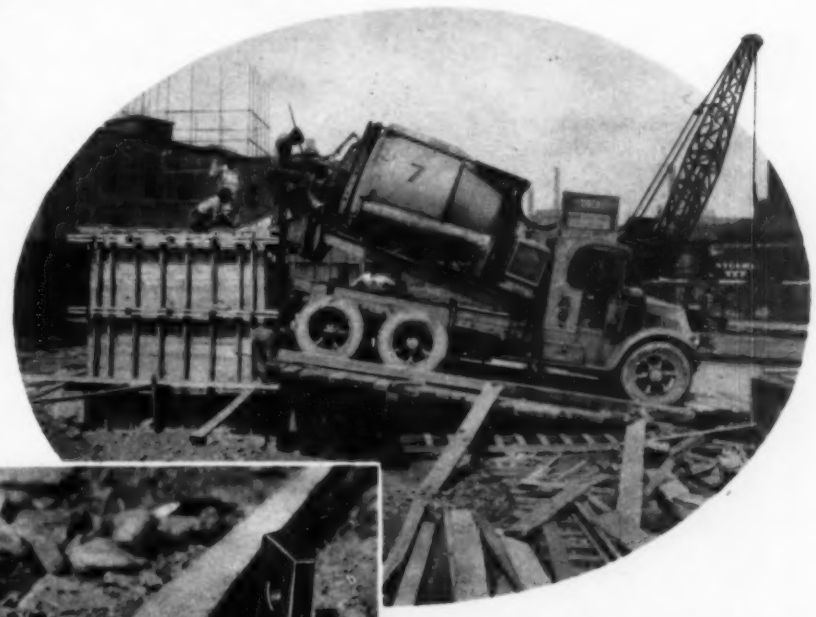
HIGH-EARLY-STRENGTH CEMENT speeds deck concreting of long viaduct made up of plate girder spans 67 to 110 ft. long on two-column piers. Sidewalks 6 ft. wide are carried by cantilever brackets on two sides of 54-ft. roadway.

cu.yd. of concrete in the deck slab of one span in 5½ hr. The surface of the slab was broomed and covered with burlap kept wet until the following morning, when it was given a seal coat of silicate of soda spread with a brush, as required by the Maryland highway specifications.

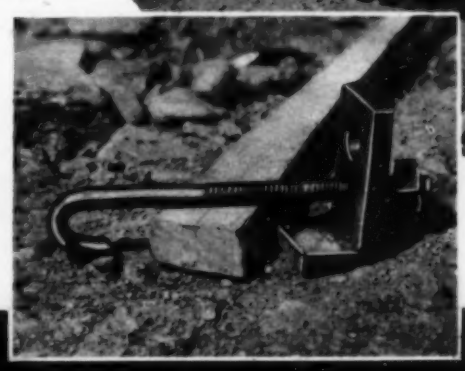
Stripping Deck Forms—A hanging scaffold suspended from the lower flanges of the stringers provided a safe and effective working platform for stripping the deck forms. Simple clamps consisting of hook bolts and steel angles (illustrated by a photograph) were designed by W. W. Kline, superintendent, to suspend the hoist blocks of the scaffold falls from the stringers. The threads of the hook bolts were battered to keep the nuts from turning off the shanks.

Progress—Following a brief start on foundation construction at the site during the week after Aug. 21, 1934, a delay of 2 months in taking possession of the right-of-way caused the contractor to lose the advantage of the best fall working weather. In spite of this delay, the contract was completed by September.

Administration—Plans for the Orleans St. viaduct were made by the



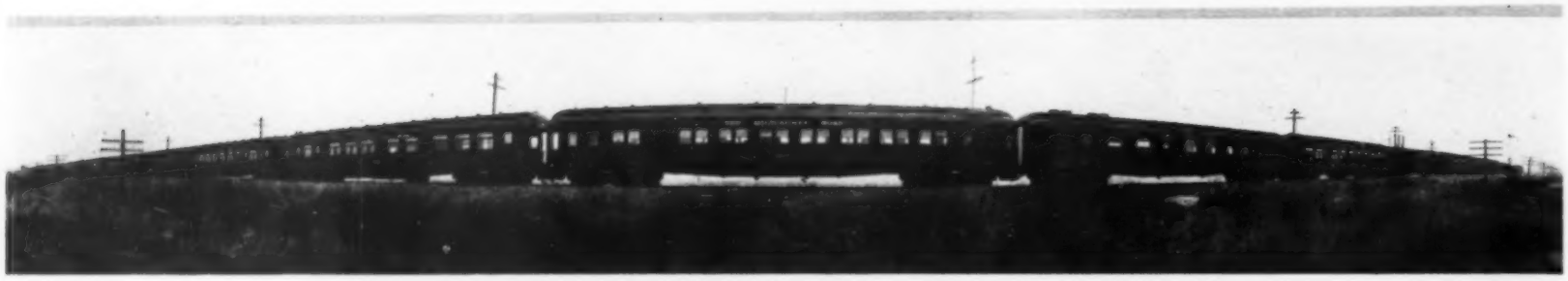
TIMBER RAMP raises rear end of truck mixer delivering concrete to lower lift of pier column.



HANGING SCAFFOLD *(below)* suspended by rope falls from steel beams is used in stripping deck forms and preparing fascia girders for concrete facing. Trolley wires pass under viaduct at this street crossing. HOOK-BOLT CLAMP *(in inset)* is attached to lower flange of floor joist to carry hoist block of scaffold falls.

Bureau of Highways of the Baltimore Department of Public Works under the direction of B. L. Crozier, chief engineer, George Cobb, highways engineer, and H. F. Lucke, Jr., associate engineer in charge of design. Whitman, Requardt & Smith, of Baltimore, were consulting engineers.

Construction was supervised by the Maryland State Roads Commission, of which H. E. Tabler is chairman; N. L. Smith, chief engineer; W. C. Hopkins, bridge engineer; E. H. Nunn, district engineer; and B. W. LeSueur, inspector in charge at the site. For the George A. Fuller Co., W. W. Kline was superintendent of construction, acting under the general direction of W. G. Distler, vice-president, Washington, D. C.



LONG TRAINS of Pullman cars are refitted and operated to supply complete commissary service.

COMMISSARY ON WHEELS

FOR HOUSING and feeding contractors' employees, particularly on railroad construction and maintenance, the Olympic Commissary Co., of Chicago, has developed and operates mobile quarters in the form of commissary trains, equipped with hot and cold running water, steel beds or regular sleeping car berths, and complete kitchen and dining room facilities. The trains are made up of standard railway Pullman cars purchased by the operating organization and refitted to adapt them to commissary use. In addition to its railway equipment the company provides demountable camp buildings which can be knocked down, moved 10 mi. or so and re-erected on public works or industrial construction projects. This spring the company was serving forty construction camps, each housing and feeding from 25 to 300 men.

An important feature of each commissary train is the kitchen car, for it is realized that on a construction job the ability of the contractor to get and to keep good men, to maintain the morale of the working force and to minimize labor turnover depends on no other single factor more than on a plentiful supply of well-cooked and appetizing food. In a typical kitchen car the equipment includes steel ranges with large hot-water tanks and restaurant-type ventilating hoods, tilting flour and sugar bins, double-deck butcher ice-boxes and double sinks for dish washing.

In the dining car chinaware and a good grade of table silverware replace the tin cups and plates associated in the old days with construction camp rations. Windows are curtained and screened. Dining coaches seat 60 men.

Two types of sleeping cars are operated. In one, regular Pullman berths are utilized, while in the other the equipment consists of 16 double steel beds with 30-lb. mattresses and a good grade of blankets. Bedding is changed and laundered at frequent intervals. Each sleeping car is provided with running water which is supplied by a pumping unit connected with the train.

In maintaining its railway trains and stationary camps the Olympic Commissary Co. aims to cooperate with the contractor as a branch of his own organization and keeps its own supervisors moving from job to job to inspect and maintain a uniform standard of boarding service.

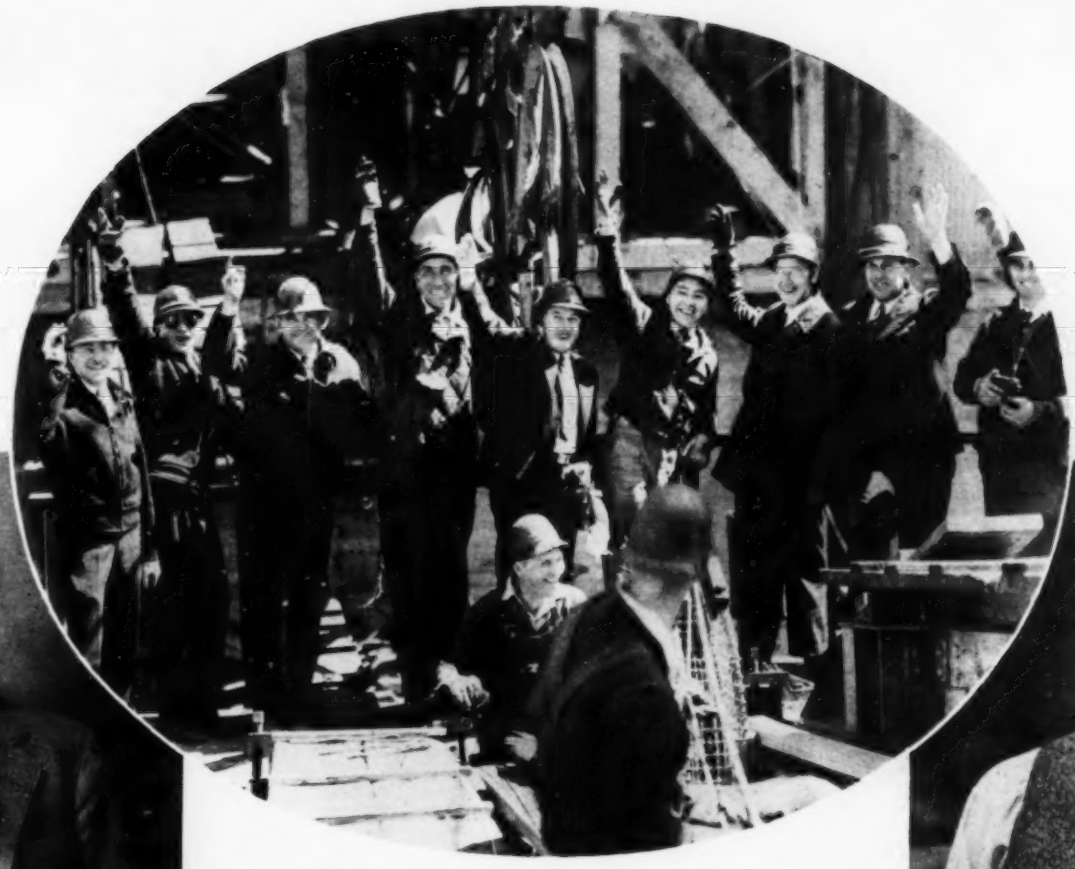
KITCHEN *(above)* equipment is installed in steel cars.

SLEEPING CARS utilize regular Pullman berths or are refitted with 16 steel double beds with 30-lb. mattresses.

DINING CAR *(below)* is equipped with chinaware, table silverware and chairs.

STORE AND OFFICE compartment is installed at end of one of the cars.

1936 PRESIDENT of New England Road Builders' Association is C. Joseph Maney *(below)* of C. J. Maney, Inc., Boston contractor, who took office following election at association's annual meeting.



COMPLETION OF CABLE STRINGING at Golden Gate bridge, San Francisco, on May 20 evokes cheers from members of John A. Roebling's Sons Co. organization: *(Standing, left to right)* Walter F. Weber, assistant to resident engineer; George E. Garthorne, assistant electrical engineer; Grover McClain, assistant superintendent; James Connors, wire stringing pusher, San Francisco anchorage; B. W. Smith, assistant to resident engineer; Edward A. Kearns, material man; Walter E. Joyce, resident engineer; Charles M. Jones, assistant chief engineer, bridge department; and Harold W. Hills, assistant to resident engineer. Two men in foreground are wire stringers at San Francisco anchorage.

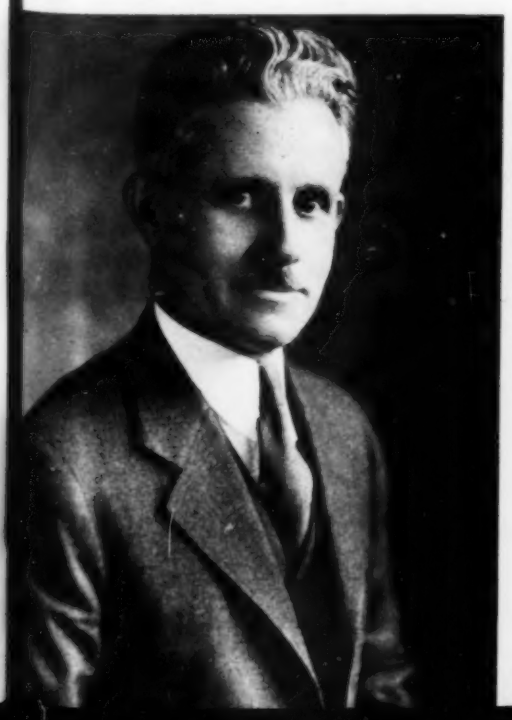
ILLINOIS CONTRACTOR Fred Schaefer *(below)*, of Jansen & Schaefer, Pekin, Ill., heads Illinois Contractors Association as president for 1936. Jansen & Schaefer organization has dredging, highway paving and bridge construction contracts in progress at present.

Present and Accounted For~

A PAGE OF

Personalities

RHODE ISLAND HIGHWAYS are built and maintained under direction of John V. Keily *(below)*, who succeeds the late Major John H. Caton as Chief of Division of Roads and Bridges, Public Works Department. Mr. Keily has been associated with state highway organization in various capacities for 25 years and until his recent appointment occupied position of assistant director, now combined with that of chief of division.



EAST RIVER TUNNEL will claim designing and organizing ability of Ole Singstad *(right)*, recently appointed chief engineer of New York City Tunnel Authority. Mr. Singstad was chief engineer during construction of Holland tunnel and now serves as consulting engineer on tunnels to Port of New York Authority, which is building Midtown Hudson Tunnel.

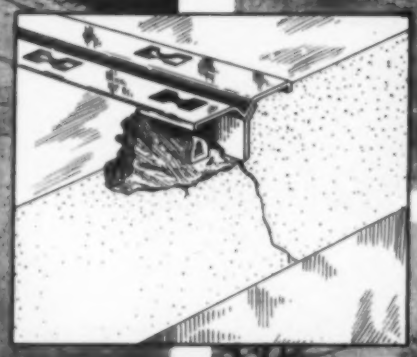
Nation-Wide News Service

NEW LEADER of Western Association of State Highway Officials is R. H. Baldock *(below)*, state highway engineer of Oregon, elected president for this year at association's fifteenth annual meeting in Phoenix, Ariz., where all twelve western states (including Texas) were represented.

NEW EQUIPMENT *On the Job*

DITCHER 4-ft. wide and with digging depth of 5 ft. is designed especially for work in close quarters such as cutting trenches for gas and water lines in narrow alleys, parkways, road ditch banks, and near field and yard fences. Vertical boom permits digging in and around honeycomb of underground pipes and other obstructions. Boom equipped with buckets which may be adjusted either for 8- or 11-in. widths. Incorporates standard features of Barber-Greene ditchers, including automatic overload release sprocket, full crawler mounting, three-point suspension, vertical boom, milling action digging, self-cleaning buckets and instantly reversible spoil conveyor. Ideal for laying underground cable, for airports, underground lighting systems, airport tile drainage and small lines in and around refineries. Ditcher loads and unloads self and travels from job to job on small trailer. Boom 3½ ft. deep is available, if desired.—Barber-Greene Co., Aurora, Ill.

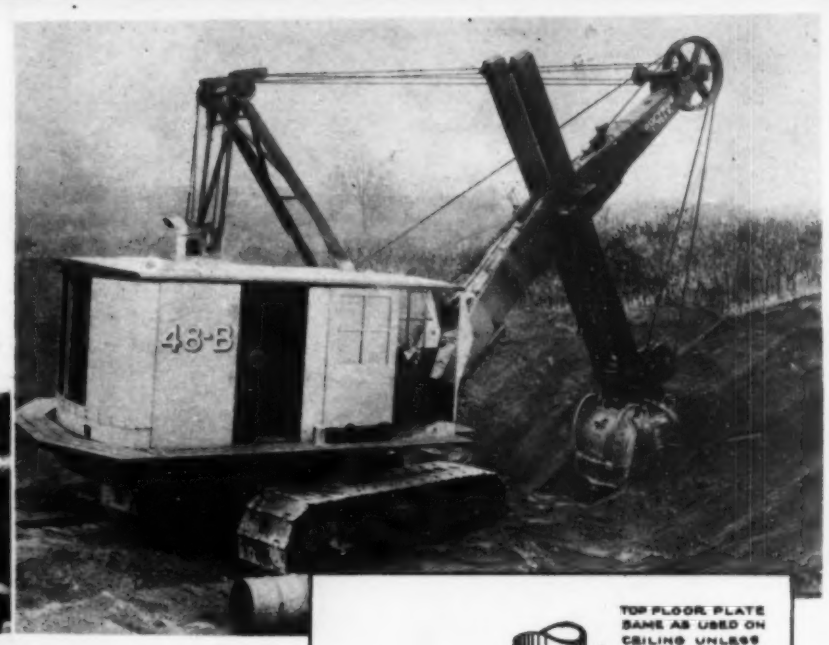
SELF-EXPANDING CORK EXPANSION JOINT may be installed both in new and old pavements. After fabrication, moisture is removed and cork is compressed to approximately 60 per cent of original thickness and wrapped in special water-resistant package to prevent reabsorption of moisture. In applying to old pavement, cork joint is immersed in water and slipped into place. Moisture causes cork to expand, filling slot snugly and providing permanent tight seal. For new highways, joint is not placed in water but is fitted into slot dry where it absorbs water from concrete, expanding without causing strain. When highway is laid in hot, humid weather, joint is of particular value because it can expand to a thickness 140 per cent of that at which it is installed. Photo in inset *(left)* shows technician measuring thickness of sample of joint after it has been expanded by exposure to moisture. Sample on right shows same product in pre-compressed state.—Johns-Manville Co., 22 E. 40th St., New York City.



COMBINED JOINT AND TRAFFIC LINE, called Marker-seal, is made of 14-gage copper-bearing sheet steel with 1-in. lugs punched down at 4-in. intervals and staggered on alternate sides for installation in 10-ft. lengths along longitudinal center line of concrete pavement. Welded to center of V, a 2-in. cracking fin *(in inset)* forms plane of weakness. Metal strip accomplishes four-fold purpose by: (1) Providing plane of weakness at joint; (2) tying slabs together at joint; (3) sealing top of joint against entry of sand or other foreign matter; (4) forming permanent traffic guide line requiring no maintenance and visible day or night.—Highway Steel Products Co., Chicago, Ill.

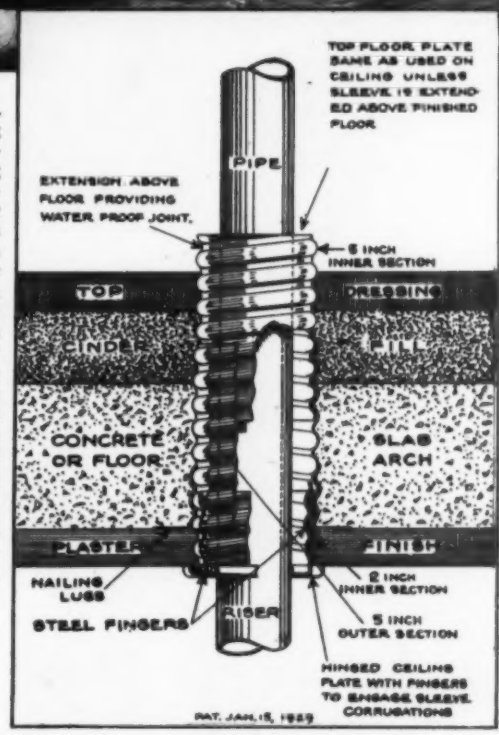
TRAFFIC-LINE PAINTING MACHINE *(left)*, called "Traf-O-Spray", consists of DeVilbiss trigger-operated, hand-spray gun, motor compressor unit and DeVilbiss paint container mounted on streamlined running gear having three pneumatic-tired wheels. Machine is short coupled so that it will readily paint curves as well as straight lines. Paints line on any solid surface, smooth or rough, using any traffic paint, lacquer or emulsion. As hand paint spray outfit, machine can be used for any kind of painting or spraying job and also for disinfecting.—Littleford Bros., 443 E. Pearl St., Cincinnati, O.

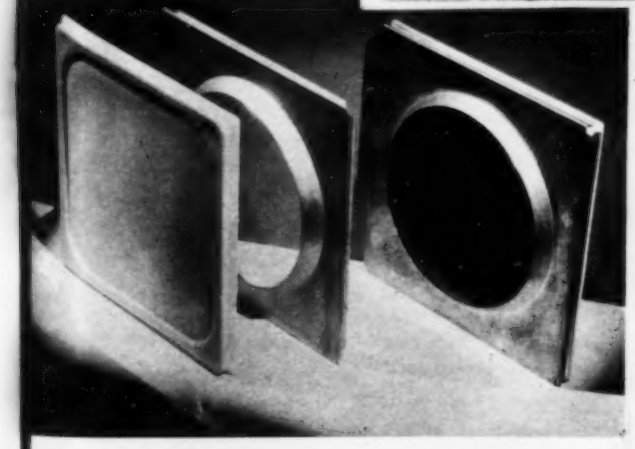
NEW CONVERTIBLE SHOVEL features speed, strength and stamina. Hoist, crowd and swing motions have been coordinated and balanced to make fastest possible digging cycle. Easily convertible as dragline, clamshell or lifting crane. Dragline-crane boom is built of alloy-steel angle chords with welded tubular cross-bracing and is available in lengths from 50 to 100 ft. High A-frame with special dragline boom suspension tackle reduces stresses on boom and lessens weight on boom point. Other features: 128 anti-friction bearings; centrally located shipper shaft; twin 42-in. line sheaves; arc-welded outside dipper handles; positive chain crowd. Choice of three mountings—standard, oversize and special oversize. Slide-in "cats" permit shipment on single car without dismantling.—Bucyrus-Erie Co., South Milwaukee, Wis.

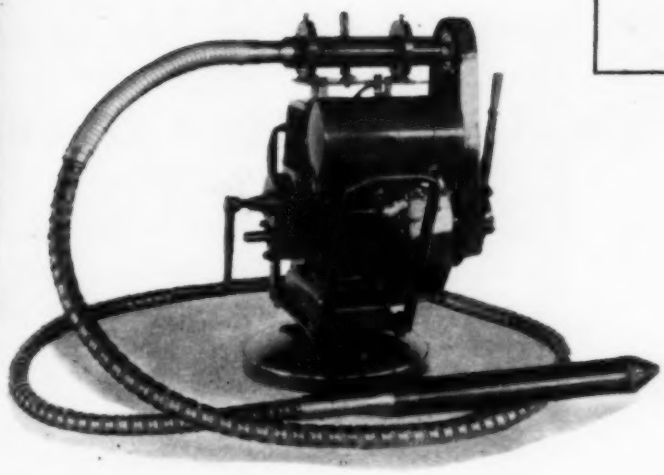


GLASS TILE GRIPPER FRAME, or "Anchorboard", consists of 22-gage metal channels 6 in. wide and 48 in. long, with spring bead edges for holding 6x6-in. MacBeth-Evans grooved glass tile units *(right)* used for ornamental facing of buildings, including new 80-ft. Schenley Tower atop three-story glass-veneered building in Times Square, New York City. Gripper is insulated with Masonite quarter-board cemented to steel pan and painted with Bakelite aluminum varnish to increase reflectivity of glass. Anchorboard is securely bolted to steel framework of building structure and joints between grippers are waterproofed with mastic filler. In modified form *(below)* gripper frame is also applied to hold glass-tile, non-glare light-reflecting ceiling lining in new Midtown Hudson vehicular tunnel between New York and New Jersey. — Sealed Joint Products Co., Inc., 630 Fifth Ave., New York City.

SPIRAL CORRUGATED STEEL SLEEVE *(right)* for protecting steam, return, hot water, sprinkler and similar pipes passing through walls, floors or partitions. Made in inner and outer sections to which other sections may be joined. Outer section provided with strap lugs for conveniently nailing to form, holding sleeve firmly in place while concrete slab or arch is poured. By addition of inner section, "Supersleeve" may be extended after slab is poured to provide for additional cinder fill, top cement dressing or wood flooring. Fitted with hinged nickel-plated plates which cover ends of sleeves and lock tightly and permanently flush to ceilings, floors or walls. Made to fit all sizes of pipe up to 5 in.—Beaton & Corbin Mfg. Co., Southington, Conn.


TOP FLOOR PLATE SAME AS USED ON CEILING UNLESS SLEEVE IS EXTENDED ABOVE FINISHED FLOOR
PIPE
EXTENSION ABOVE FLOOR PROVIDING WATER PROOF JOINT.
5 INCH INNER SECTION
TOP DRESSING
CINDER FILL
CONCRETE OR FLOOR SLAB ARCH
PLASTER
FINISH
NAILING LUGS
STEEL FINGERS
RISER
2 INCH INNER SECTION
5 INCH OUTER SECTION
HINGED CEILING PLATE WITH FINGERS TO ENGAGE SLEEVE CORRUGATIONS
PAT. JAN. 15, 1929





CONCRETE VIBRATOR *(left)* of flexible shaft-driven type obtains constancy of vibration rate by use of adequate size engines with large bore and stroke instead of dependence on excessive motor rotation. Three models available: two having either 2- or 3-hp. gasoline engines or 1½- or 2-hp. electric motors and mounted on free swiveling bases, and third with 4-hp. engine is mounted as wheelbarrow with pneumatic tire. Vibrator heads usually are furnished with engines as follows: (2 hp.) 2-⅜x21-in.; (3hp.) 3x21-in.; (4 hp.) 3½x21-in. Engines run at comparatively low speed assuring longer life. High pulsation rate (4,200 pulsations per minute) is obtained by V-belt countershaft, from which power is transmitted to vibrator by multiples of 7-ft. lengths of flexible drive consisting of piano wire core running within steel-armored rubber casing. Vibrators self-contained, fully inclosed. For flat slab work, such as highway paving, vibrator may be mounted on sled or float.—White Mfg. Co., Elkhart, Ind.

OXYACETYLENE CUTTING ATTACHMENT *(left)* handles all but heaviest metal work, including light sheet metal, with speed and efficiency of full-size cutting blowpipe. Operates on low or medium pressure acetylene, with equally satisfactory results. Equipped with improved cutting valve, with removable seat, centralized under cutting lever. Mixed gas passage formed by three Ambrac tubes. Flashback resistance afforded by length of attachment and four 90-deg. changes of direction. Body of pressure-forged bronze and head of manganese bronze forging make tool especially strong and light.—Linde Air Products Co., 205 E. 42nd St., New York City.

PIPE WELDING FITTINGS *(below)* called Weldolets and Thredolets, are especially adapted for making tee, cross, side-outlet, side-outlet and cross, and double-cross branch pipe connections. Manufacturers claim they eliminate loss of pipe strength, reduce friction and turbulence and form permanent leak-proof joints requiring no maintenance. These fittings are made of drop-forged or cast steel. They have funnel-shaped outlets which produce proper flow through pipe; heavy external ribs to compensate for loss of strength in cut pipe; wide bases which offer greater resistance to bending stresses. In addition, they require no templets, nor complicated cutting, forming or fitting of main pipe and branch. Installed either by oxyacetylene or electric-arc welding. Full range of sizes available.—Bonney Forge & Tool Works.—Allentown, Pa.

Heavy-duty TEXACO Sheet Asphalt paving in Atlantic City, N. J.

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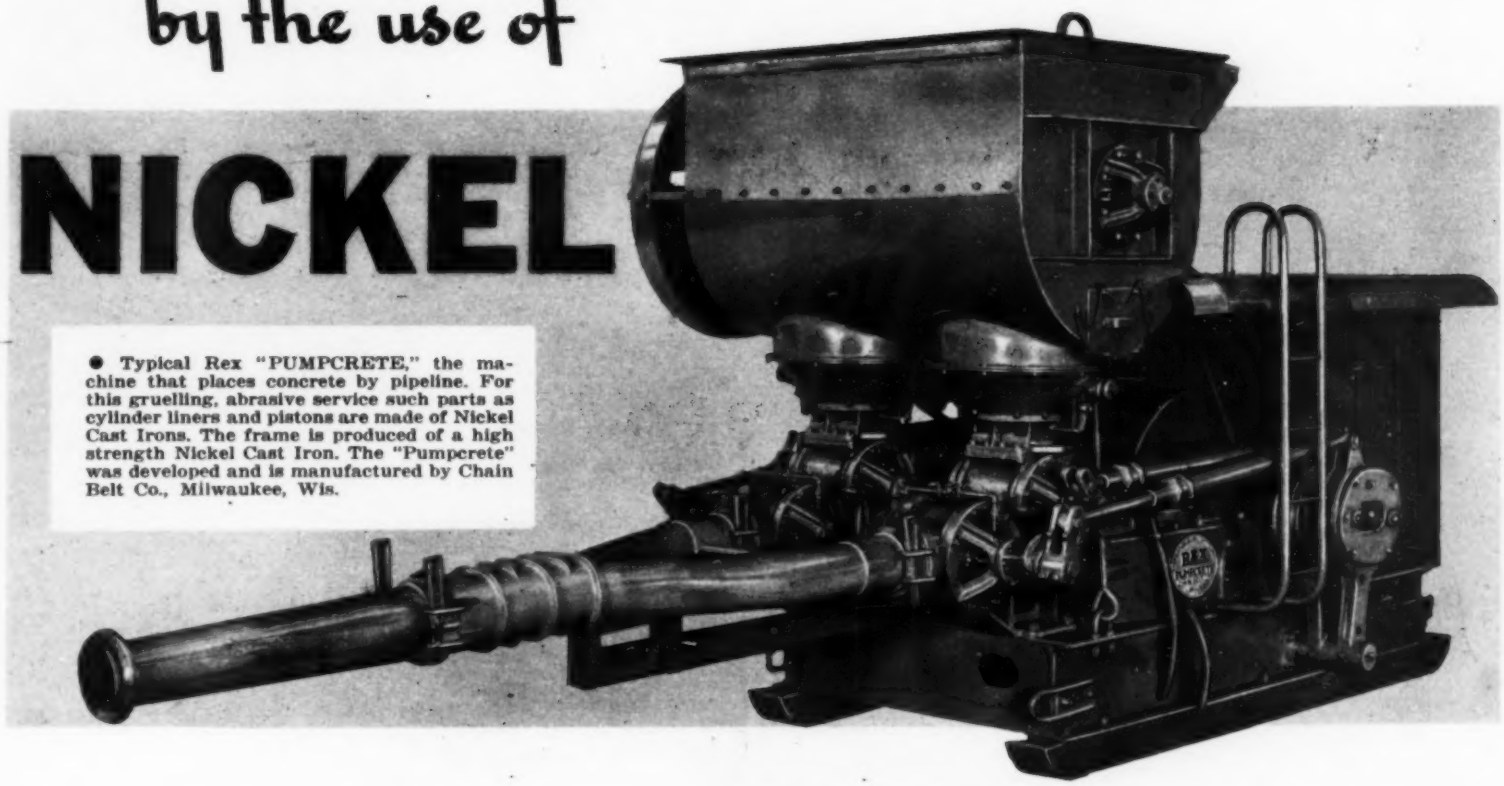
TEXACO Asphaltic Concrete paving on Texas Centennial Grounds; building of exhibits still under way when photo was taken.

Securing tough, waterproof mat with TEXACO Surfacing Material in Fulton County, N. Y.

Salvaging old pavement by TEXACO resurfacing in Atchison, Kansas.

TEXACO ASPHALT

Unique Machine curbs ABRASION in PUMPING CONCRETE by the use of NICKEL



● Typical Rex "PUMPCRETE," the machine that places concrete by pipeline. For this gruelling, abrasive service such parts as cylinder liners and pistons are made of Nickel Cast Irons. The frame is produced of a high strength Nickel Cast Iron. The "Pumpcrete" was developed and is manufactured by Chain Belt Co., Milwaukee, Wis.

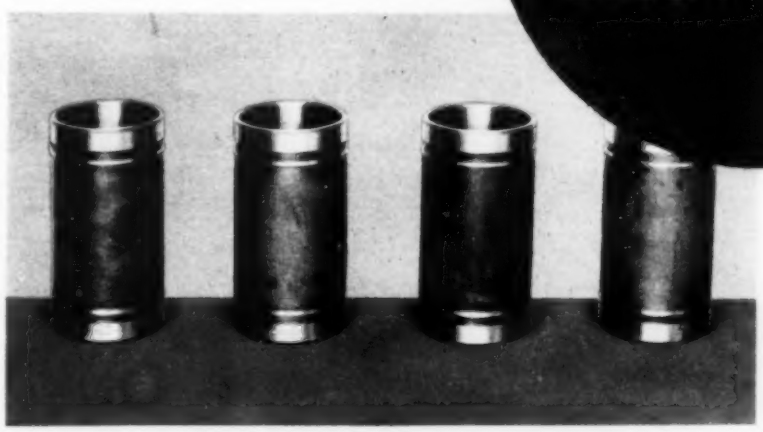
● The new Rex "Pumpcrete," introduced by Chain Belt Co., Milwaukee, Wis., offers concrete evidence that Nickel Cast Irons can "take it" when it comes to handling abrasive materials. The frame, cylinder liners and pistons are made of strong, highly wear-resistant Nickel Cast Irons.

● This remarkable unit which is capable of pumping concrete up through steel pipe some 15 or 20 stories has been used with success on many large construction projects.

Our casting specialists are always glad to recommend suitable compositions of nickel steels and cast irons for any service.

NICKEL CAST IRONS

● These PISTONS, used in the Rex "Pumpcrete," are cast of 2½% Nickel Iron, heat-treated. Brinell hardness 350. Approximately 8 in. dia. x 3 ft. long, these Nickel Iron castings possess a dense, uniform, close-grained structure that offers excellent resistance to the abrasive action of concrete. Note particularly the extremely high polish.

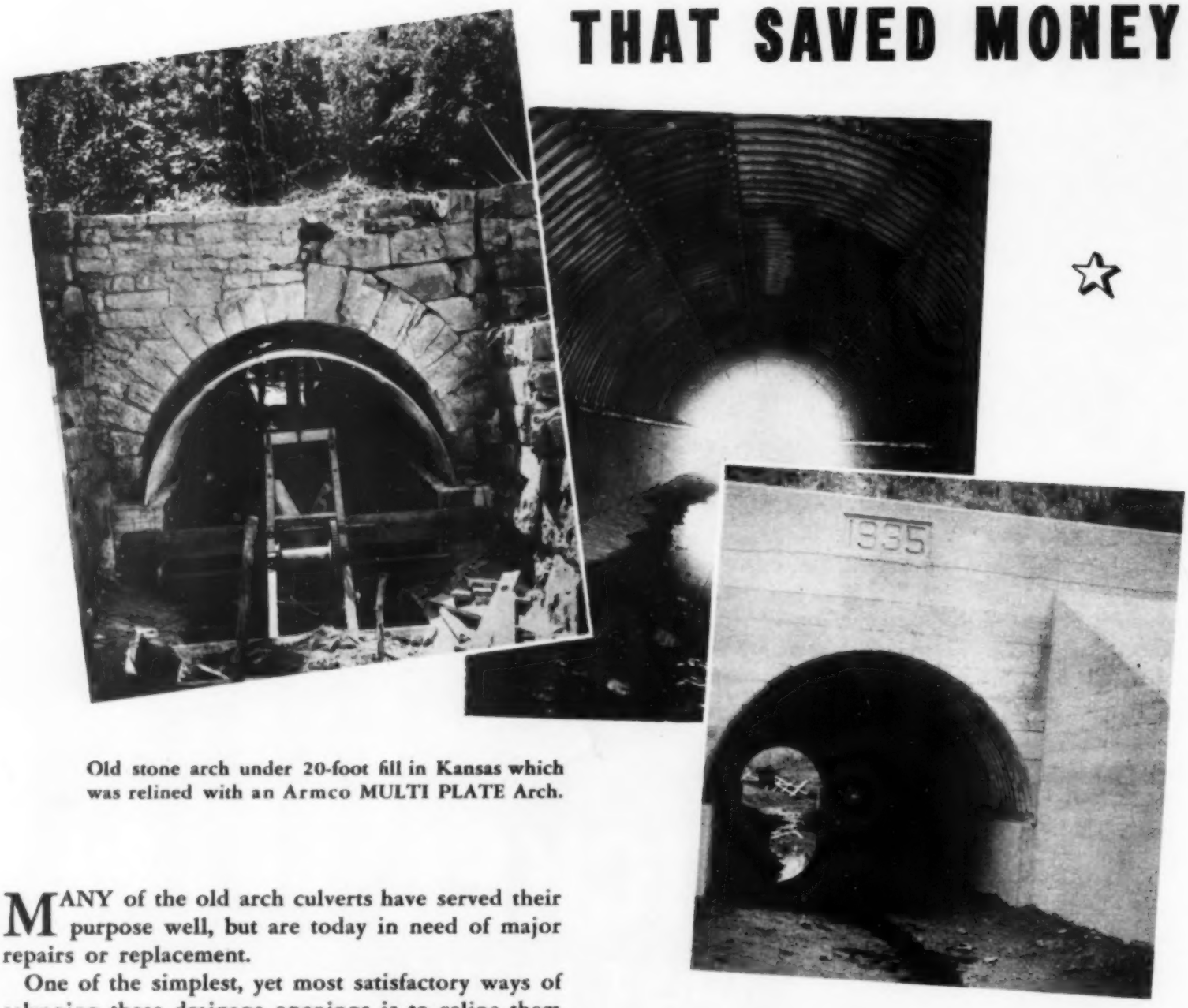


● *(Left)* The LINERS in the cylinders of the "Pumpcrete" are cast centrifugally of a wear resisting or Nickel iron possessing a minimum hardness of 500 BHN. Like their mating parts, the pistons shown above, these cast Nickel iron liners offer remarkable resistance to the abrasiveness of concrete.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL STREET, NEW YORK, N.Y.

Another Relining Job

THAT SAVED MONEY



Old stone arch under 20-foot fill in Kansas which was relined with an Armco MULTI PLATE Arch.

MANY of the old arch culverts have served their purpose well, but are today in need of major repairs or replacement.

One of the simplest, yet most satisfactory ways of salvaging these drainage openings is to reline them with Armco MULTI PLATE. There need be but little reduction in waterway area.

These thick corrugated iron plates are quickly bolted together to form a strong, durable structure, either as an arch or a pipe.

Let an Armco drainage man discuss the application of MULTI PLATE to your particular problems. Call the nearest Armco representative or clip and mail the coupon. Armco Culvert Manufacturers Association. Middletown, Ohio.

Please send me your latest free catalog on Armco MULTI PLATE.

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FOR ECONOMICAL DRAINAGE

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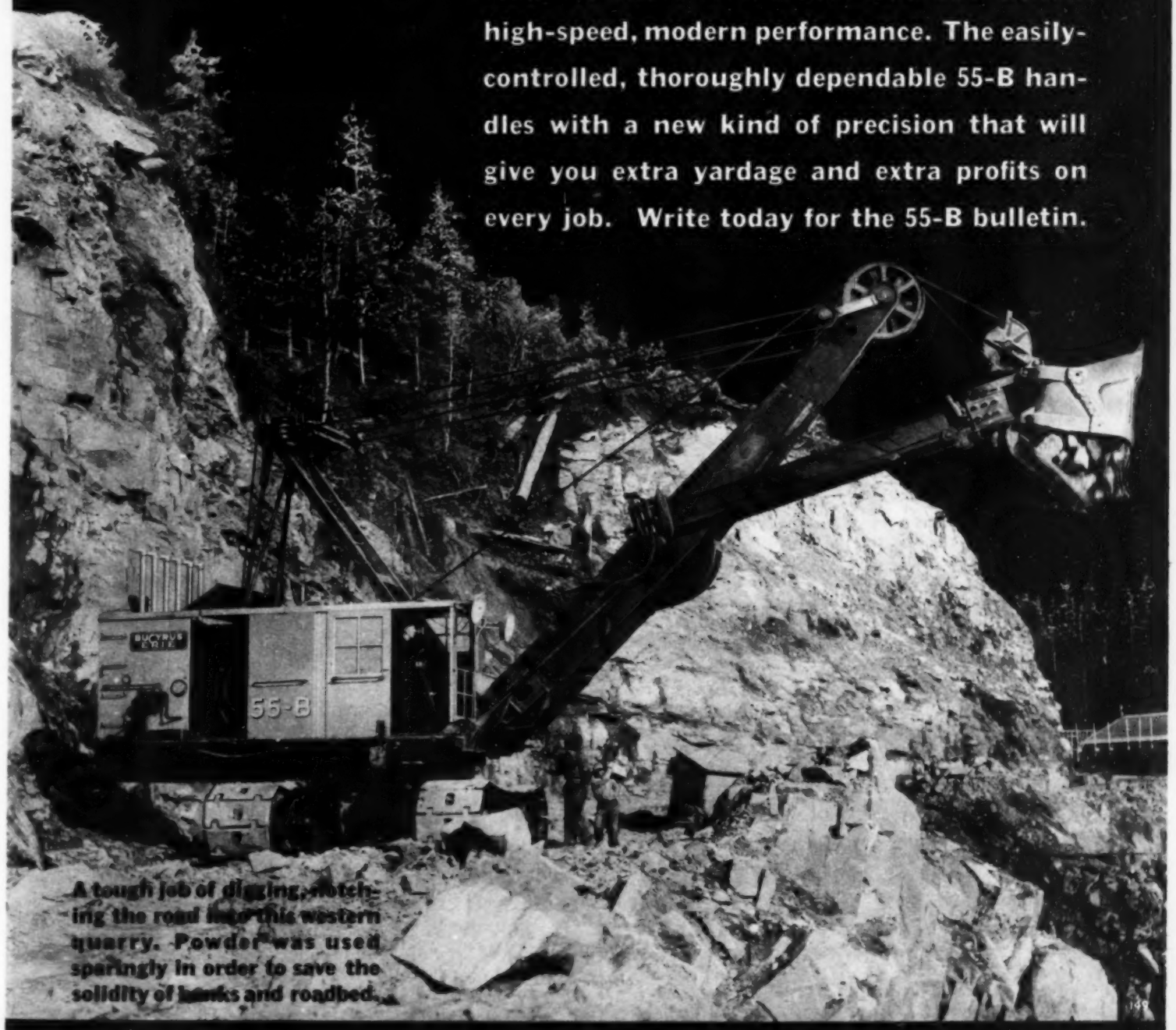
In a class by itself

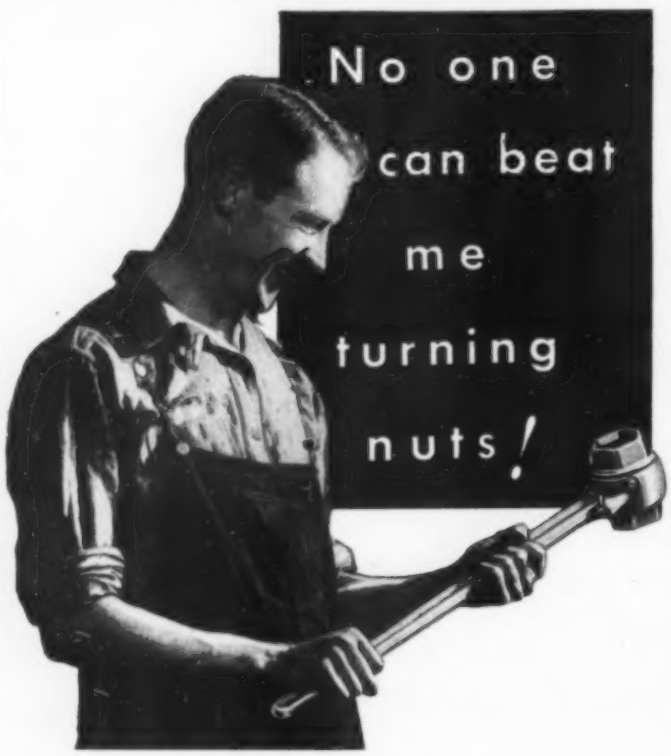
Big, rugged, powerful, the 55-B is an up-to-date, 1936 model, field tested and proved, ready to move in on your job and deliver high-speed, modern performance. The easily-controlled, thoroughly dependable 55-B handles with a new kind of precision that will give you extra yardage and extra profits on every job. Write today for the 55-B bulletin.



A tough job of digging, notching the road into this western quarry. Powder was used sparingly in order to save the solidity of banks and roadbed.

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN, U. S. A.



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REVERSIBLE RATCHET WRENCH!

We couldn't improve the speedy RATCHET Streamline motion of the "FAVORITE"! We couldn't better the "FAVORITE" basic idea that the wrench *never leaves the nut* until the nut is tight! No sir—but we HAVE made this famous wrench STRONGER, rust-proof. We've put better, stronger metal and better design into handles, heads and pawls. We plated it with CADMIUM to prevent rust. You'll get even better, longer service now from the NEW-model "FAVORITE." Send that coupon, below, for all the details.

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"FLEX-PLANE

at the CLEVELAND AIRPORT"

FLEX-PLANE Finishing Machines were selected by the United States Government for finishing the runways of the great Cleveland Airport.

FLEX-PLANE Finishing Machines were also selected by all the contractors engaged in building the great Triborough Bridge at New York City—six FLEX-PLANE machines being used, ranging from 10 to 40 feet wide. Problems had to be solved before a finishing machine could be selected and these problems were met by the use of FLEX-PLANE.

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Large Capacity and Portability
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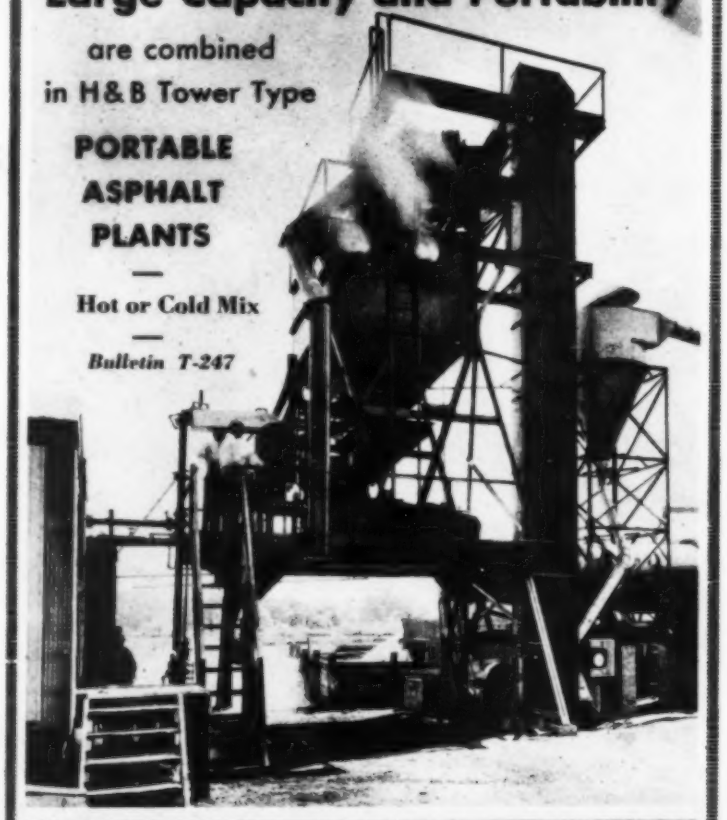
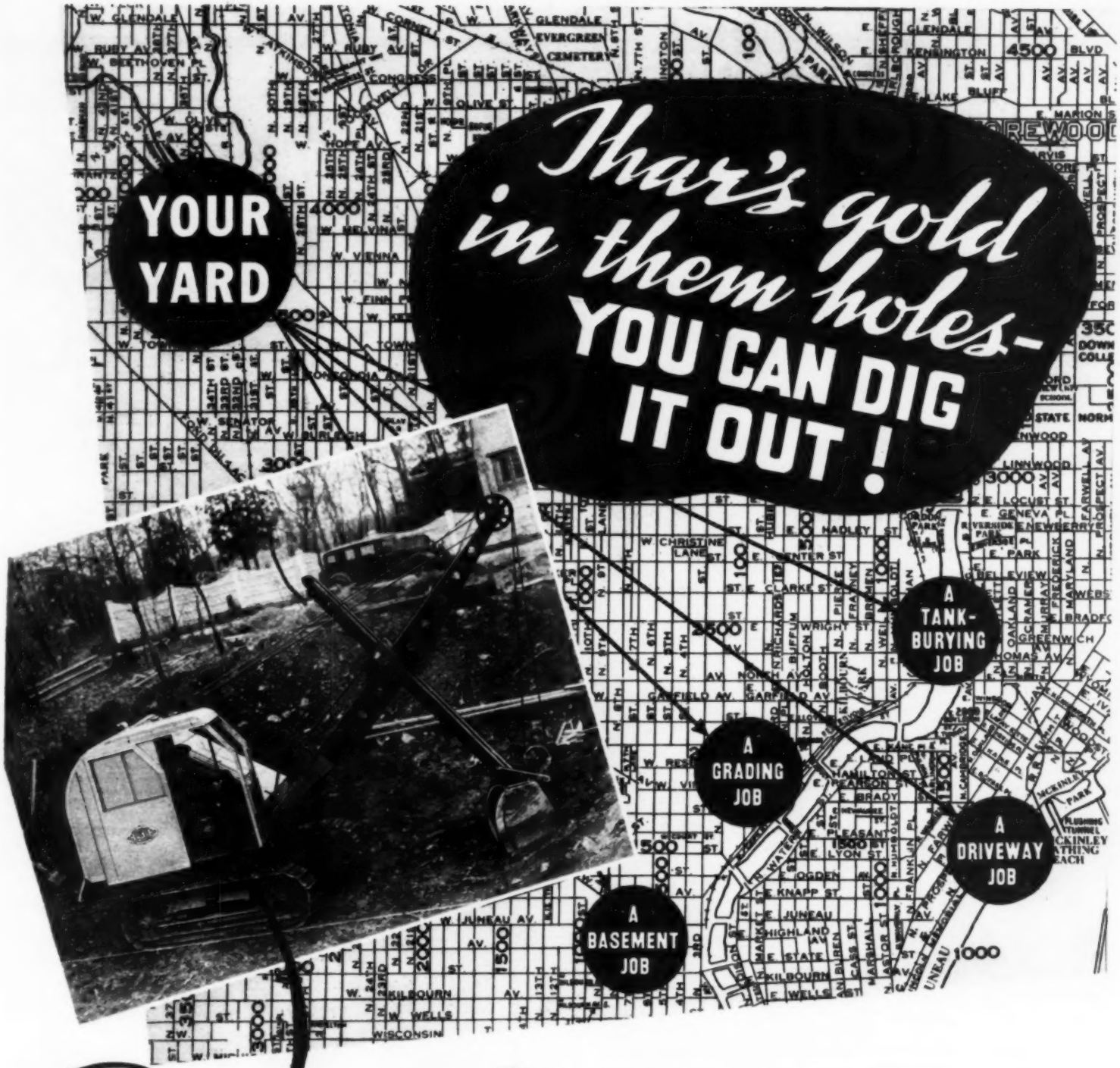
in H & B Tower Type
PORTABLE ASPHALT PLANTS
—
Hot or Cold Mix
—
Bulletin T-247



HETHERINGTON & BERNER, Inc.
INDIANAPOLIS, INDIANA
Builders of Asphalt Paving Machinery for over thirty years



Weighs less "on its shoes." That means less shoring to get out of excavations . . . less damage to roadways and curbs.

EXCAVATING profits come from digging . . . not traveling. The faster you can get from job to job, the lower your costs will be, and the higher your profits. That's truer today than ever before, for 1936 is a small job year. ● Grading jobs, basement jobs, land clearing jobs—the kind of jobs the Bantam-Weight is built for. It's light and easy to move. You can take it many a place where heavy machines are prohibited. ● And once on the job its fast cycle, its sturdy V-8 motor, its ability to work in tight places make it a real producer. Get a Bantam-Weight and go after the real money in small jobs.

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4494 W. NATIONAL AVE. *Established 1884* MILWAUKEE, WIS.

Warehouses and Service Stations: Hoboken—Memphis—Jacksonville—Seattle—Dallas—Los Angeles—San Francisco

P&H BANTAM WEIGHT

FIRST TO THE JOB — AND FIRST THRU

ONE OF THE 22 P&H PACEMAKERS FOR 1936

ON NEW YORK'S NEW TRI-BORO BRIDGE

Safety, PLUS!

Wet-weather safety is the first requisite of all surfacing materials. But it isn't the whole story. Modern planking must be light—to allow for increased loads. Local labor should be able to install it easily, rapidly. The bridge must be ready for traffic the instant the last plank is laid—or during application, if necessary. There should be no warping, cracking, splintering or decay. And throughout its long years of service, maintenance costs should be virtually negligible. Hence, this picture of work in progress finds J-M Mineral-Surfaced Asphalt Bridge Plank going down on the Bronx Approach (over the Bronx Kill) of New York's newest bridge. For data sheets on this material, and on the smooth-surfaced type also, write to Johns-Manville, 22 East 40th Street, New York City.

Johns-Manville MINERAL-SURFACED ASPHALT BRIDGE PLANK

JM

PUMP IT OUT

.. it's Cheaper

● When you use the slickest little pump you have ever seen.

Weighs only 130 pounds yet pumps 50 gallons per minute. ½ H.P. gasoline engine.

Height 16" — Length 30" — Width 14"

No water priming or foot valves.

IT'S A GIANT IN MIDGET'S CLOTHING

Write for leaflet

S. B. STINE, INC.

OSCEOLA MILLS, PA.

"— — to secure WATER TIGHTNESS" when the SPECIFICATIONS read:—"*the contractor shall take such other steps as are necessary to secure water tightness.*"

Use SIKA to stop leakage through structurally sound sub-grade masonry — dams, retaining walls, filter beds, tunnels, manholes, walls, floors, etc. SIKA mixed with portland cement is easily applied by hand and will successfully seal off infiltration from inside even under pressure.

Write us about your waterproofing problems.

SIKA, Inc.

1943 Grand Central Terminal, New York, N. Y.

Now FRONT END CHARGING

Conceived, Developed and Perfected by SMITH ENGINEERS

SAVES HEAD ROOM!

Again SMITH ENGINEERS forge ahead with new ideas that result in greater economy on large engineering projects. This time it's front end charging. A battery of Smith Tilters built to both charge and discharge through the same drum opening. Permits a more compact set-up. Requires only one set of batchers to charge all mixers. Reduces over-all height of mixing plant.

FASTER OPERATION—Automatically operated feed chute seals drum opening and permits batcher turn head to be moved to next mixer immediately after charging. Aggregates enter drum faster since flow is almost in a straight line.

PERFECT MIXING—No need to back tilt mixers excessively to secure fast charging. Famous Smith end-to-center mixing action is retained.

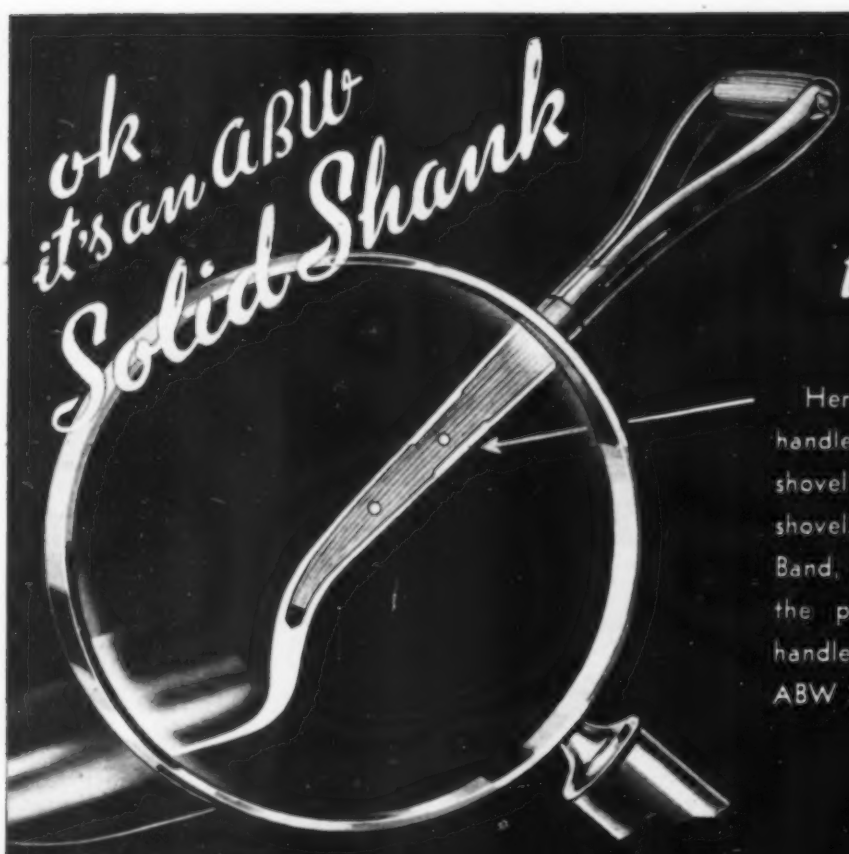
First originated by Smith engineers—leaders for 36 years—front end charging is proving highly successful on the big jobs. For more than a year it has been giving wonderful service on Tygart Valley Dam. And three of the Smith 4-yard Tilters which poured the Boulder Dam, were arranged by the contractor for front end charging at Bonneville Dam. Write for further data.

THE T. L. SMITH COMPANY
2851 N. 32nd Street
Milwaukee, Wis., U.S.A.

TYGART VALLEY DAM NOW BEING POURED BY FOUR SMITH 84-S TILTERS ARRANGED FOR FRONT END CHARGING

SMITH MIXERS

THE BOULDER DAM MIXERS



ok it's an ABW Solid Shank

Built to last!

Here's the reason there is more handle strength to an ABW Solid Shank shovel than the ordinary solid shank shovel. It is the famous ABW Shock Band, giving double thickness of steel at the point of greatest strain in the handle. A patented feature only on ABW Solid Shanks.

ASK YOUR JOBBER

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THERE IS WRIST ACTION IN THE

PORTER

SWIVEL HEAD CUTTER

The Swivel Head principle—of time-tested Porter design and construction—permits the head to swing in any degree, from in line with the handles, to a full right angle position on either side. It actually "bends to the job"—over, under and around obstructions. Full cutting power is maintained in every position. The most versatile cutter ever developed. Saves time and labor on all difficult jobs. Frees the operator from strain and awkward handing. Order from your supplier or write us for descriptive circular.

H. K. PORTER, INC.
EVERETT, MASS., U.S.A.
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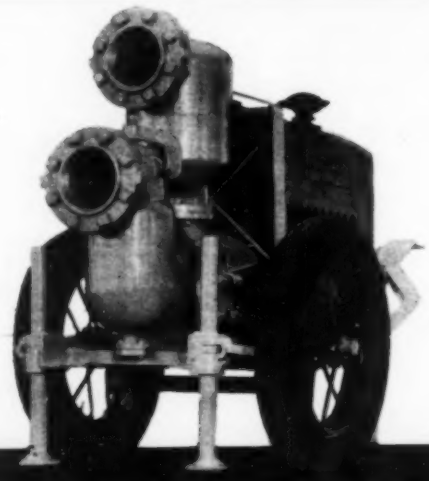

LABOUR PUMPS

Husky strength and maximum simplicity—only one moving part—combine to make LaBour Pumps dependable as the day is long. They're always on the job—which means fewer grey hairs in your head and more dollars in your pocket. Write for complete details.

LaBour

THE LABOUR COMPANY, INC.
1300 Sterling Avenue
ELKHART, IND.

Three Le Tourneau 12-Yard Carryalls loading on the Tri-City airport.

ON THE NATION'S AIRPORTS

. . . from coast to coast Le Tourneau units are hastening safer flying by moving the earth to make larger landing fields and longer, smoother runways. Typical performance is the work now being done by three Le Tourneau 12-Yard Carryalls, one 8-Yard Carryall, a Rooter and an Angledozer on the Tri-City airport in Sullivan County, Tennessee. There, in heavy red clay with some limestone outcroppings, the Rooter and an RD8 tractor ripped up the earth to speed Carryall loading. The four Carryalls on an 1,800-foot round trip haul placed 5,000 cubic yards of this ripped material in a timed 14-hour period, left behind a smooth field for one of Tri-City's long runways. Such yardages as this are common wherever Le Tourneau equipment works, whether it be on airports, highways or dams. Such yardages mean more construction from tax money, more profits for earthmoving contractors.

Ask your "Caterpillar" dealer to show you what Le Tourneau job-proved equipment is doing on construction projects near you.

R. G. LE TOURNEAU, INC.

PEORIA, ILLINOIS **STOCKTON, CALIFORNIA**

***Cable address:* "Bobletorno"**

Manufacturers of: **ANGLEDOZERS, BUGGIES, BULLDOZERS, CARRY-ALL SCRAPERS, CRANES, DRAG SCRAPERS, POWER CONTROL UNITS, ROOTERS, SEMI-TRAILERS.**

LE TOURNEAU

Tupelo, Mississippi's hurricane-harried city, carries on. These veteran Carryalls are building an airport for the city.

Making a smooth landing field for Nashville's airport.

Le Tourneau Heavy-Duty Rooter and RD7 tractor ripping ground on the Knoxville airport.

WELLPOINT FACTS

In wellpoints, unblocked screen area is measurable. Without a lot of it, any wellpoint will clog up. The Moretrench Wellpoint has 350 square inches of unblocked, bronze, filter mesh — *four to fifty times as much as other wellpoints.* It is the only point that jets itself into position, using the full force of the water to thoroughly wash out the hole and that means freedom from plugging up.

The Moretrench Wellpoint costs more per point, costs much less to install and will deliver twice the water under the same conditions. It works continuously where other points will not work at all. That makes the Moretrench Wellpoint cost *one half or less* for doing the same amount of work. Our records prove that *the last cost is always the true cost.*

THE MORETRENCH WELLPOINT SYSTEM
"MAKES EVERY JOB A DRY JOB"

MORETRENCH CORPORATION

Works: Rockaway, New Jersey *Sales Office*: 90 West St., New York

ELECTRIC HAMMERS

for Concrete Vibration

Long before the development of vibrators, Syntron Electric Hammers, with their 3600 blows per minute, in addition to their many uses, were used by contractors to vibrate wall form and flat slab concrete placement. Model No. 16 Hammer, shown here, equipped with a 30-in. bluntly forked tool, vibrates the concrete floor slab to produce a denser and stronger concrete with a smooth and practically waterproof surface.

Write for catalog showing the many uses for electric hammers on your work.

SYNTRON COMPANY

400 NORTH LEXINGTON AVENUE
PITTSBURGH, PA.

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NEW TWO WHEELERS
WITH
PNEUMATIC
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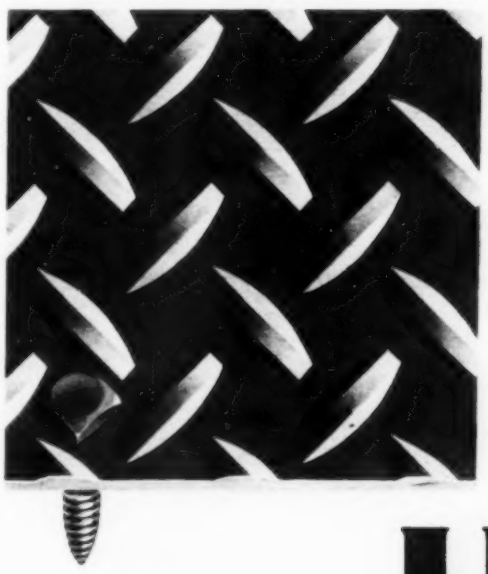
IMPROVED
» 7S and 10S machines or other MASTER and SILVER-STREAK Non-tilts from 3 S to 28S, WONDER Tilters from half-bag to two-bag capacity, also CMC Hoists, Plaster and Mortar mixers, Pumps, Saw Rigs, BETTER BILT Wheelbarrows, Concrete and Material Carts with steel wheels or pneumatic tires. » » » »
CONSTRUCTION MACHINERY CO., WATERLOO, IOWA

Stop This

. . . . with Inland 4-Way Traffic Plates

Safety is one reason why Inland 4-Way Traffic Plates (patented) have been applied to so many bridges. The other reason is that 4-Way Plates restore an old bridge floor to serviceable condition —lengthening its life several years at low cost.

On the Inland 4-Way pattern, projections center one another at right angles. 4-Way grip—secure traction, safety against side skid. The thorough drainage of 4-Way Plates is also a safety factor in bad weather.



Projections on 4-Way Plates overlap one another both lengthwise and crosswise. This reinforces the plate, makes it just as stiff and strong lengthwise as it is crosswise—extra reinforcement for the bridge floor.

Inland 4-Way Traffic Plates are made in widths, lengths, and thicknesses for all highway requirements. Complete information mailed on request. INLAND STEEL COMPANY, 38 S. Dearborn St., Chicago, Ill.

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Sheets Strip Tin Plate
Plates Structurals Piling

Rails Track Accessories
Bars Rivets Billets

What do You look for in a

TRUCK SHOVEL

Performance
Convertibility
Dependability
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Stamina
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model T-6

MICHIGAN

has them all!

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MICHIGAN POWER SHOVEL Co BENTON HARBOR, MICHIGAN, U.S.A.

Action Everywhere with NOVO

Increasing construction figures are coming in from all over the country — increased sale of NOVO Equipment directly parallels the upward trend of the construction curve — wise contractors are tooling up for profits with NOVO.

NOVO SELF-PRIMING CENTRIFUGAL PUMPS. Most adequately powered pumps built. The only pumps built with Power Unit and Pump manufactured by the same Company — unified control and responsibility.

They give more gallons for less money, for there is no inefficiency from overheated or overloaded engines — no expensive shutdowns for repacking, for they operate without packing. Leather seals on the impeller shaft make and hold the seal. The ideal pump for every job, and everyone knows it.

NOVO HOISTS. The most complete and up-to-date line of Hoists up to 60 H. P. on the market. The complete line from 1,000 to 15,000 lbs. capacity, incorporate the most practical features of hoist design. Also Novo Dragline Hoists, approved the world over.

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Send information on NOVO Self-Primers ..... NOVO
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KOEHRING

FASTER *with* FLOW-LINE DISCHARGE

FLOW-LINE

—means speedy and full chute discharge for Koehring 28-S, 56-S and 84-S Concrete Mixers used for central mixing plants and large volume concrete construction jobs. The Flow-Line discharge permits a natural flow of concrete, reduces abrasive wear, causes a minimum of segregation—decreases discharge time.

KOEHRING HEAVY DUTY

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

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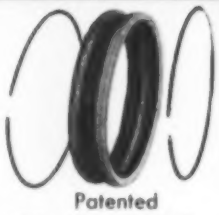
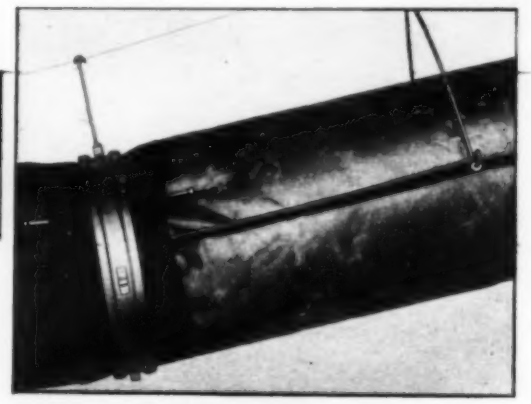
MineVent FLEXIBLE BLOWER PIPE for Economy

—with strong, simple, airtight Coupling
—made up in a jiffy, eliminates twisting

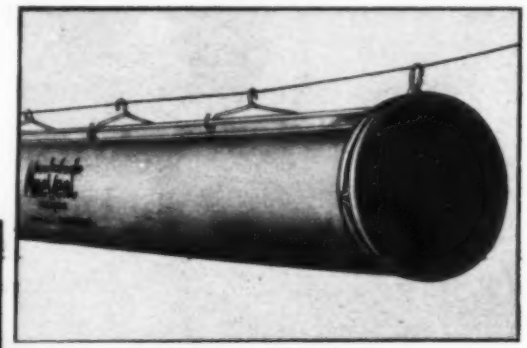


Patented "MineVent" Coupling

This rust-proof, quickly demountable COUPLING is practically indestructible. Odd lengths can be used and repairs made without sewing. Ability to *rotate* MINE-VENT in coupling facilitates placing in proper position *without twisting*. In case of wear and tear, a new "hold" can be gained simply by pulling tubing an inch or so through the rings. Slack is taken up in same way.



TYPE A SUSPENSION (note coupling)



TYPE B SUSPENSION (tubing never fully collapses when not in use)

OTHER SALIENT FEATURES

Mine-Vent supplied in any length desired without sewing. Fabrics *specially treated* to reduce air friction and resist corrosive conditions. Unique TWO-SEAM SUSPENSION provides positive support and materially reduces installation and upkeep costs. To reduce your air line costs — investigate MINE-VENT now!

AMERICAN BRATTICE CLOTH COMPANY

WARSAW, INDIANA, U.S.A.

EAGLE PASS, TEXAS — L. L. Stoffel
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JAEGER "SURE PRIME" PUMPS HAVE IT - -

- Fastest 100% Automatic Prime,
- Greater Efficiency at Any Lift,
- Thousands of Hours of Steady Service!

4" 3" 2" 6" 8" 10"

SIZES

7000 to 200,000 G. P. H.

New Catalog and Prices Will Tell You Why Jaeger Pumps Outsell All Others--Write for It.

THE JAEGER MACHINE CO.

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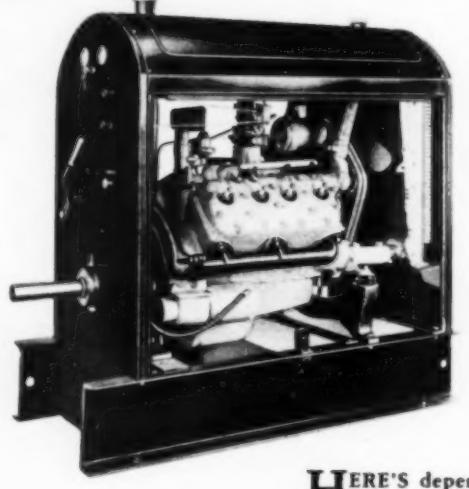
LOW COST POWER

with this

KRW FORD V-8 UNIT



HERE'S dependable, low-cost power up to 60 H. P. — complete, compact, portable. Ideal for welders, compressors, hoists, pumps, well drilling outfits and other contractors' equipment.

Assembled with brand new heavy duty Ford V-8 Truck engine. Large capacity radiator protected by heavy screen. Engine rubber mounted — outfit complete with governor gas tank, 17 plate battery, instruments and louvered side panels to thoroughly enclose the engine.

WRITE for complete information, price, and data showing how this unit will *pay for itself out of savings* in a few weeks, whether operated on gasoline or natural gas. You can buy thru your Ford Dealer and benefit by local service and low-cost Ford engine replacement feature.

***Also* K R W ELECTRIC PLANTS**

20 KW outfit with dual voltage take-off for handling *both* light and power requirements simultaneously.

K. R. WILSON 15 Lock St. **BUFFALO, N.Y.**

EXCLUSIVE BUILDER OF APPROVED FORD SHOP EQUIPMENT SINCE 1916

PROPER BALANCE for easy handling

● **TRAYS** All welded steel — 14 gauge in No. 3, and 12 gauge in Nos. 6 and 7. **Continuous** butt-welded rod of ½" diameter rolled in top edge. Capacity — 6 cubic feet of concrete.

● **WHEELS** 30"—36" or 42" in diameter, with ⅜" flat tires or with oval tires having a thickness at center of ½".

● **AXLES** On No. 3 carts which have 30" or 36" diameter wheels, axles are made of alloy steel, heat treated after forging. Underslung type.

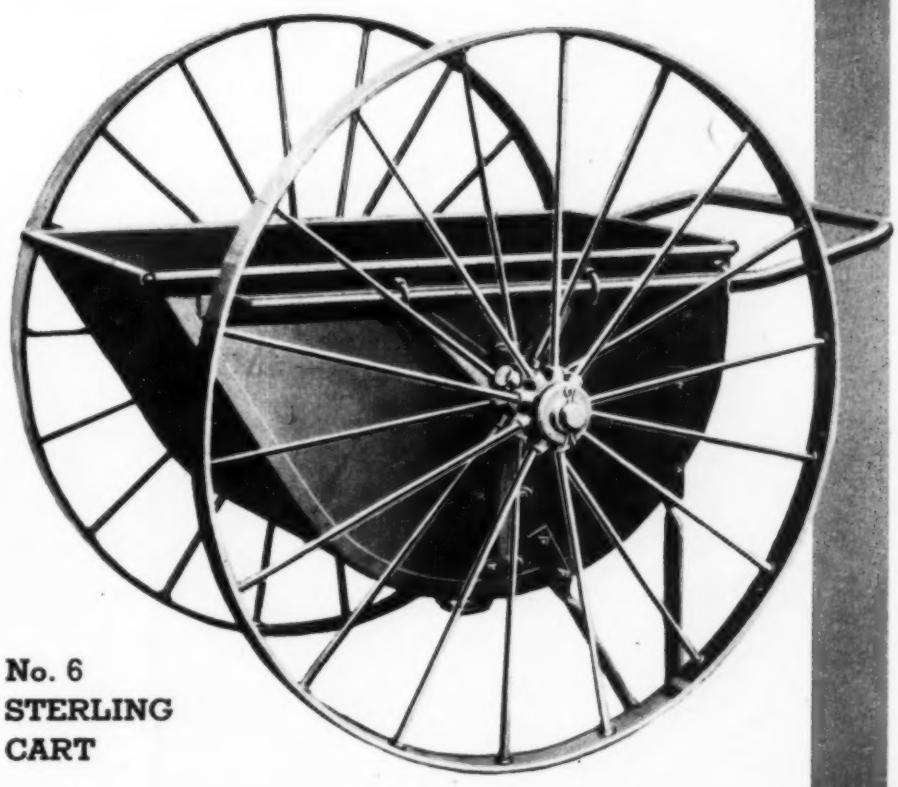
No. 6 carts having 42" dia. wheels are equipped with trunnion type axles. No. 7 carts have 42" wheels and through axles.

● **LEGS** Carts furnished with or without bar steel legs.

● **ROLLER BEARINGS** Furnished as specified on any cart.

● It is not a STERLING without the Square "S" S

Sterling Concrete Carts are designed to withstand the hard service that carts receive on construction jobs. They have the proper tray shape for easy discharge and proper balance for easy handling.



No. 6
STERLING
CART

S **STERLING WHEELBARROW CO.** S

900 SOUTH 71ST STREET

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Points the way to Profitable Road Building

The use of Blaw-Knox Road Building Equipment provides the short cuts to economy which are essential to profits in today's scheme for building roads.

How will this equipment fit into your road building operations?

Just ask Blaw-Knox!

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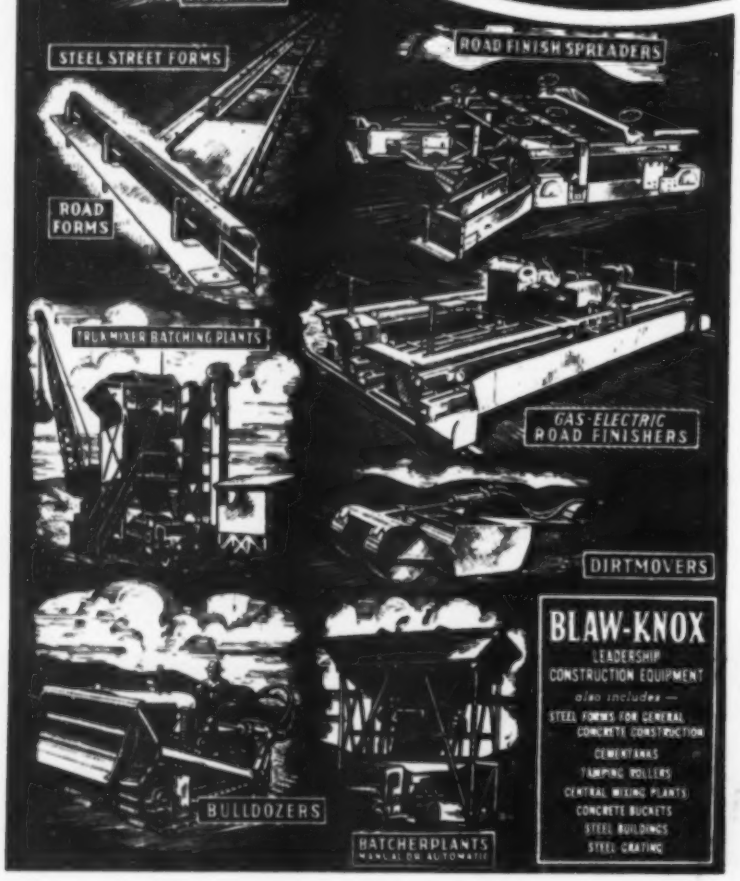
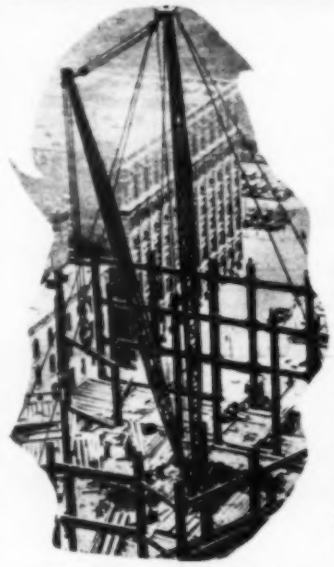

TRADE MARK
DOBBIE
ESTABLISHED 1862

All Steel DERRICKS



Steel Erectors Guy Derrick, with Ball Bearing Footblock.

Guarantee Safety

When you guarantee safety, you economize — for safety means uninterrupted operation and lowest possible maintenance costs.

And DOBBIE All-Steel Derricks have been designed for safety and consequent economy. They have a safe load capacity of almost twice their rating. You need this assurance of dependable safety and continuous performance.

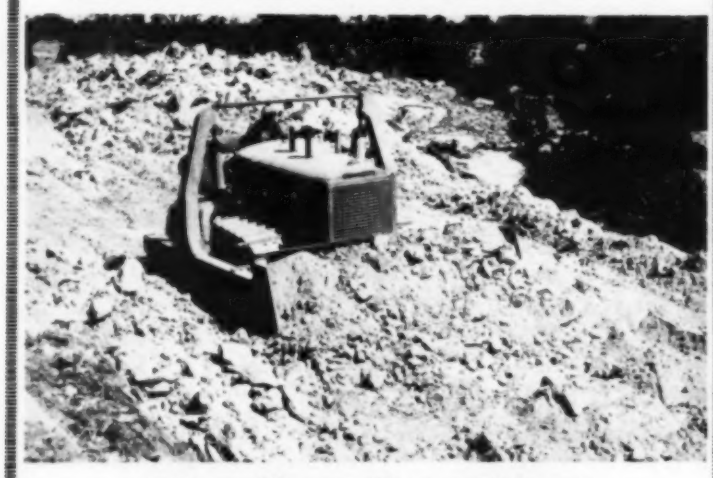
SAVE POWER BY USING BALL OR ROLLER BEARING FOOTBLOCKS AND SHEAVES. Built in both Guy and Stiff-leg types. Write for information and prices.

DOBBIE FOUNDRY & MACHINE CO.

Niagara Falls, N. Y.

Other Dobbie Products—Steel Derricks, Timber Derrick Fittings, Hand Winches, Motor Driven Winches, Blocks, Sheaves, etc.

BAKER
BULLDOZERS



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GRADEBUILDERS
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These simply-constructed, direct-lift Bulldozers have all the features a contractor wants. Better control — less repairs — strength for the hard jobs and better all around performance account for more Bakers on more jobs.

THE BAKER MFG. CO.

568 Stanford Ave.
Springfield, Illinois

WHY CONTRACTORS ARE TURNING TO CALCIUM CHLORIDE FOR CONCRETE

NEARLY ten years ago, this turntable was built for the Central Vermont Railway, at White River Junction, Vermont, by the A. D. Ward Company.

Built to a specification requiring not more than ¾ of an inch deviation from a perfect circle radius of 120 feet, the actual deviation was but $\frac{3}{16}$ inch. The construction superintendent states that the plasticity given the concrete by the use of Calcium Chloride in the mix is what made this close limit work possible.

Concrete including Calcium Chloride Admixture flows into forms so readily that much less tamping or spading is required. No tamping means no distortion of forms—consequently a true circle. Today this job is in perfect condition.

This is a practical illustration of improved workability as discussed in the recent report of the National Bureau of Standards, which covered studies with concrete mixes containing Calcium Chloride. The Bureau of Standards report says, in part, "There was an increase in the average flow from 28 to 41 with the addition of 2% of Calcium Chloride." This flow indicates increased workability.

Many contractors today feel that Calcium Chloride is as economically advantageous for summer as for winter use, on account of the increased workability, greater density and finer finish obtainable.

Write to any Association member for methods and specification of Calcium Chloride Admixtures in concrete.

Calcium Chloride Association

The Dow Chemical Co. . Midland, Michigan
Michigan Alkali Co., 60 E. 42nd St., New York
Solvay Sales Corp., 40 Rector St., New York
The Columbia Alkali Corp., Barberton, Ohio

CALCIUM CHLORIDE
FOR MODERN CONCRETE CURING

An AUTOMATIC owner writes:

"We have been convinced that the AUTOMATIC bucket has increased our production at least 50%.

"The Page bucket will dig in deep holes as long as you keep rope long enough to go deeper. On one of our jobs we had hard pan,—other type buckets slid over the top of this material. The Page AUTOMATIC came through full every drag we made."*

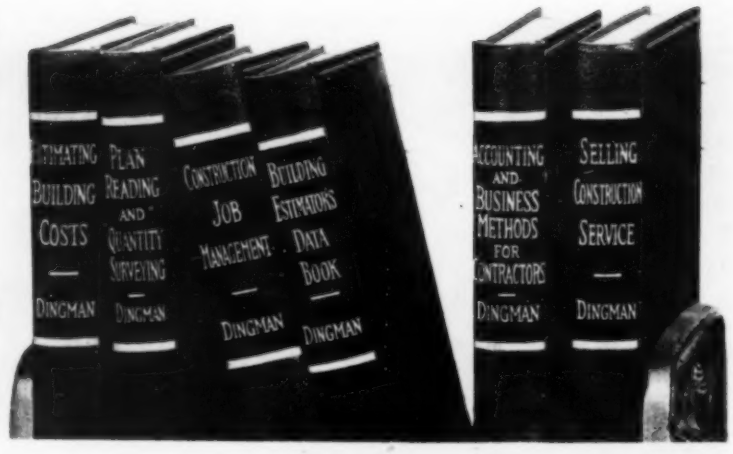
** From a letter in our files.*

You also can speed up your dragline work—increase yardage 20% to 50%. Learn all about the digging advantages of the Page AUTOMATIC—ask users—see your equipment dealer—or, write us direct. Address Department "S." Bulletin "THE AUTOMATIC" gladly sent on request.

BUILT IN SIZES 3/8 to 15 CUBIC YARDS

". . . DIG WITH A PAGE AUTOMATIC"

PAGE ENGINEERING COMPANY
CLEARING POST OFFICE CHICAGO, ILLINOIS



Practical facts on every phase of building construction!

HERE is a Library of books that are packed to the covers with the best plans and methods for speeding up production, saving materials and labor, and cutting costs. These six books cover every phase of practical construction work from estimating building costs to the selling of construction service—from plan reading and quantity surveying to practical job management. With the aid of these books the contractor can get business in these dull times by learning how to make savings, and through them being able to make lower bids. The construction superintendent can learn how to keep costs down, which insures his job these days.

The Dingman Building Contractors' Library

The Dingman books have won a wide reputation among builders and building contractors for their sound, practical and easy-to-understand discussion of building construction work. All of the material has been drawn from actual practice.

This library is intended for

[1] The building contractor who wants a handy reference set that will give him almost instantly a ready answer to most of the problems that come up in the course of the day's work.

[2] The young men in the building industry who intend to make the business of construction their life work, and who want the kind of guidance that will aid them to climb to the top.

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Each one of the volumes in this set is a complete handbook on some important subject. Sturdily bound and pocket size, it will go right "on the job" with you for immediate consultation.

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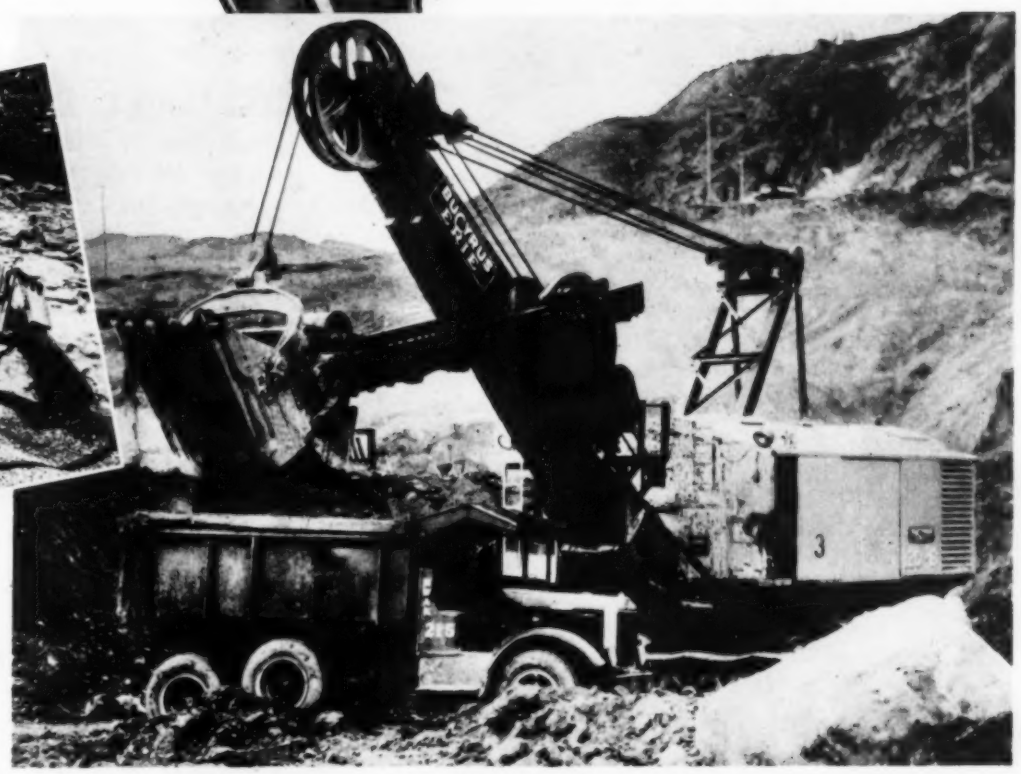

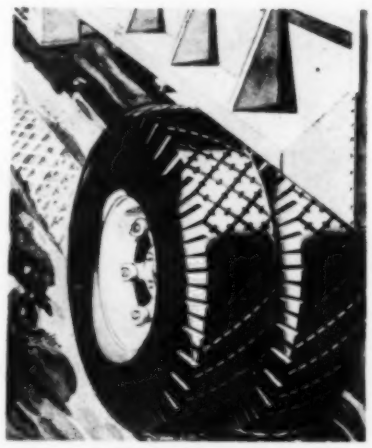

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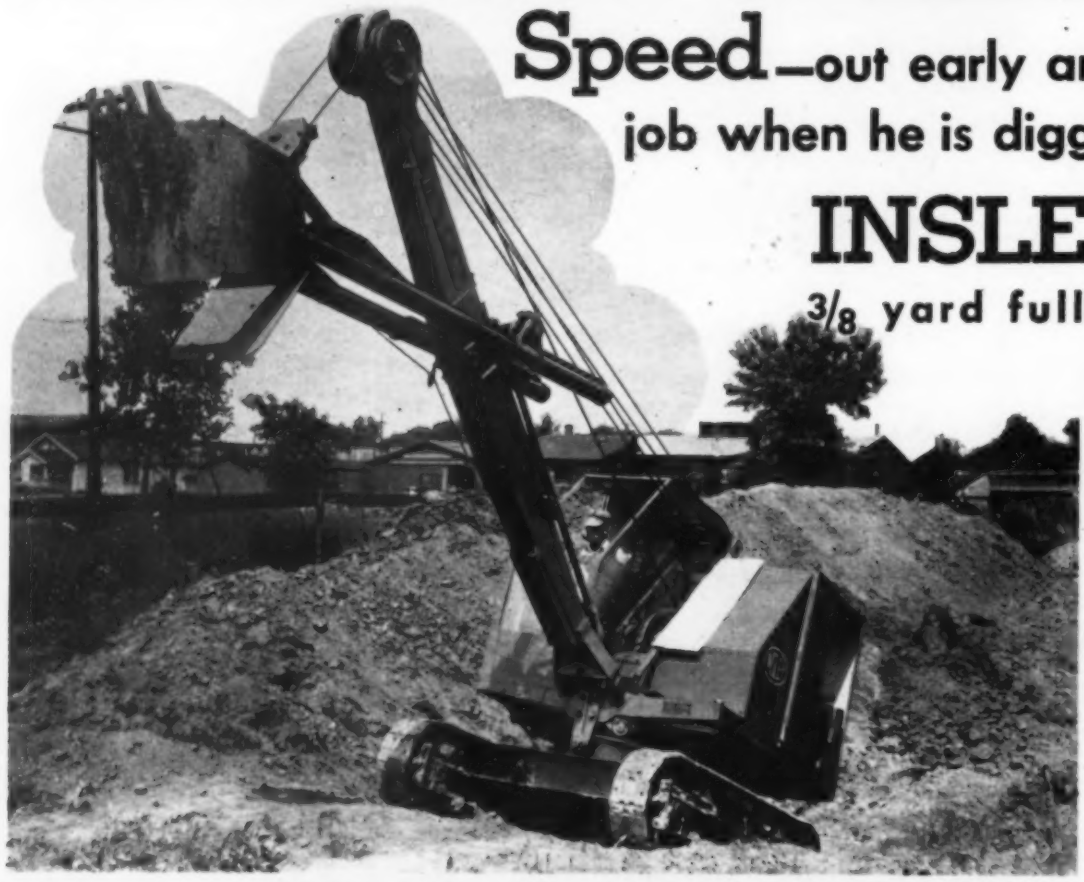

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3/8 yard full revolving shovel

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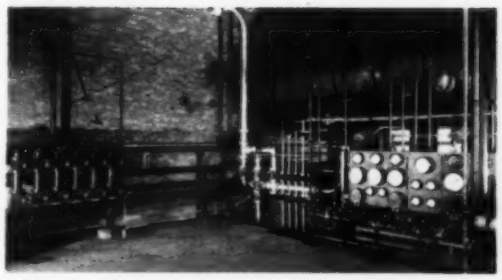

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Jones & Laughlin manufactures a complete line of hot rolled bars, bar shapes, standard structural shapes and plates. The complete line of standard structural shapes, including angles, beams, channels, tees and zees, contributes materially to the ability of J & L to serve the construction industry.

You profit in two important ways when you depend on J & L steel construction products. First, you save time and money because the wide variety of J & L steel products permits you to concentrate your purchases and thus avoid the expense and trouble of separate negotiations with a number of different sources.

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Engineers and contractors everywhere have learned from experience that they can always depend on J & L construction products for high quality, satisfactory performance, and long trouble-free service. You, too, will profit when you specify and use J & L construction products for your requirements.

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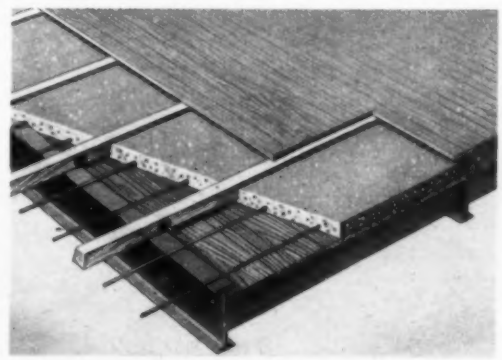
FOR ALL YOUR STEEL REQUIREMENTS

Piling . . . Plates . . . Structural Shapes including Junior Beams and Lightweight Channels . . . Bars for Concrete Reinforcement . . . Assembled Road Bar Mats . . . Tie Wire . . . Steel Pipe . . . Fabricated Structural Work including Steel Plate Construction, Nails and Spikes.

•

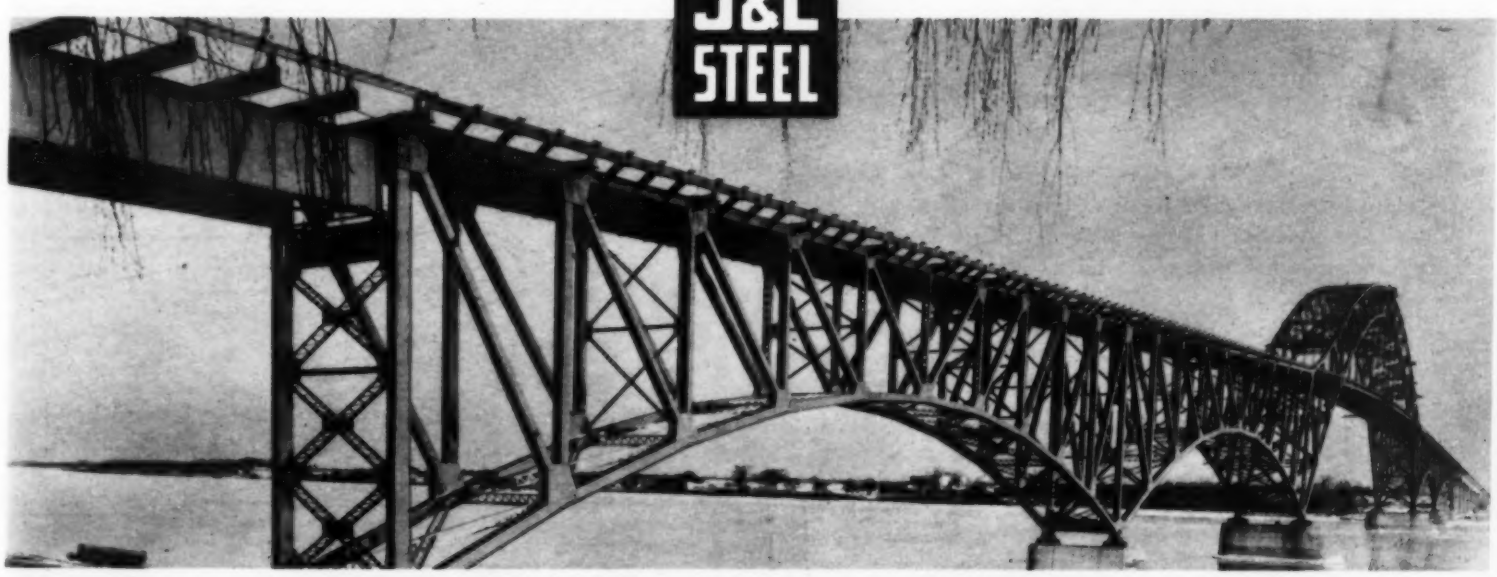
J & L Diamond Bars for Concrete Reinforcement

J & L Diamond Bars are made in two types, round equivalent deformed and square equivalent deformed. They are uniform in cross section and true to size, with uniform clean cut and accurate ribs which provide maximum area to insure bond. They are made of new billet steel which assures uniform strength and most desirable bending qualities.



New Economies in Construction with J & L Junior Beams

J & L Junior Beams are being designed widely in floor construction of churches, schools, apartment buildings, hotels and many other types of light occupancy buildings. They are used for roof purlins and other purposes as well as for floor sections. They are simple in design and easy to install. Their adaptability and light weight effect important economies.



'Fabricated by J & L" means correct design and economical erection

Shown here is one of the Grand Island Bridges spanning the Niagara River at Grand Island, N. Y.—an interesting example of Jones & Laughlin fabricated structural work.

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AMERICAN IRON AND STEEL WORKS
JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA

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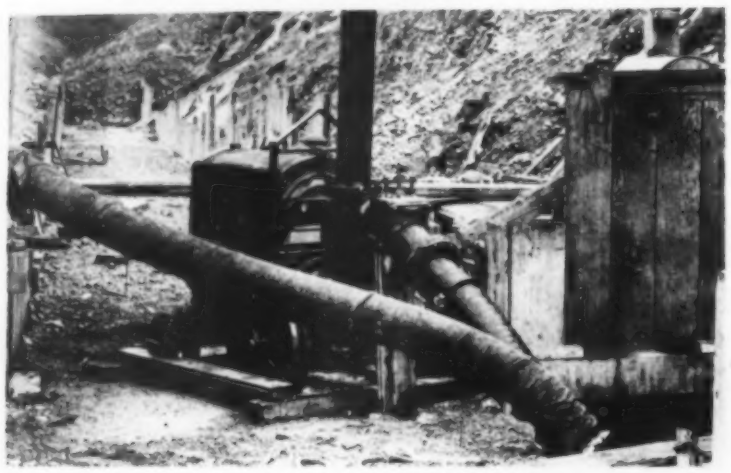
*Operated by National Bridge Works Division of Jones & Laughlin Steel Services, Inc.
Canadian Representatives: JONES & LAUGHLIN STEEL PRODUCTS COMPANY, Pittsburgh, Pa., U. S. A., and Toronto, Ont., Canada

G&R PUMPS

REPEAT ORDERS

Back in March 1934, The C. & R. Construction Co. of Boston bought their first 4 inch G&R pump from the Parker, Danner Co. It wasn't long thereafter until they bought another 4 inch G&R pump. Then in 1935 they bought another 4 inch G&R pump and so far during 1936 they have bought two 6 inch G&R pumps.

These repeat orders for G&R pumps, given to the Parker, Danner Co. of Boston by the C. & R. Construction Co. express more impressively the performance and dependability of G&R pumps than the volumes of flowery adjectives that fill many construction equipment advertisements.



The 6 inch G&R pump in the above picture is one of 4 G&R pumps (the other 3 are 4 inch) the C. & R. Construction Co. now have at work on section 109 of the North Metropolitan Relief Sewer for the State of Massachusetts.

And on the same project —

The J. F. Fitzgerald Construction Co. have two 6 inch G&R pumps and one 2 inch G&R pump on section 108.

The Edward M. Matz Co. have two 4 inch G&R pumps on section 115.

Not a single shutdown. They are always "On the job with a steady throb".

THE MOST IN PUMPS FOR THE LEAST MONEY — WHY PAY MORE

Sold by 100 Distributors in principal cities

THE GORMAN-RUPP CO.

Mansfield, Ohio

Contractors demanded:

An inexpensive, sturdy, light, portable, all-purpose derrick.

Clyde engineers designed:

A line of 3, 4 and 5 ton Steel Utility Derricks, in guy and stiff-leg types, that more than meet their requirements. They are of all steel construction with a combination boom end that makes them adaptable for pile-driving, clam-shell or hook work. Inexpensive units that are invaluable to the builder.

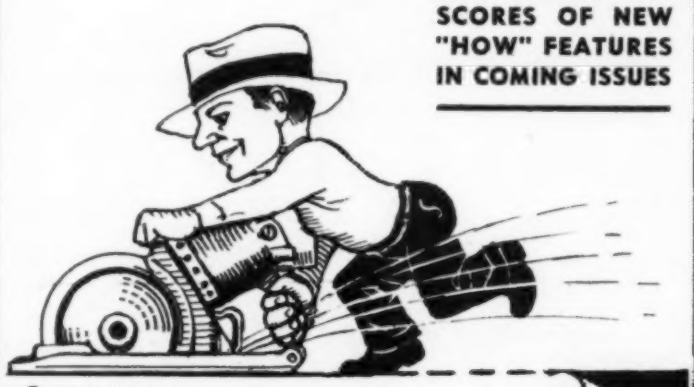
CLYDE SALES CO.

Duluth, Minn.

Cut it OUT!

Quit borrowing CONSTRUCTION METHODS from your long-suffering friends — and cut out this coupon so that you will have your own copy each month to enjoy at leisure and keep for future reference.

DON'T MISS THE SCORES OF NEW "HOW" FEATURES IN COMING ISSUES



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Handling Forms

By ADOLPH J. ACKERMAN

Step-by-Step Field Methods

Raised-Edge Curb for Concrete Pavement

Building Wreckers Develop

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HYDRAULIC BORING MACHINE

Installs Telephone Conduits Under

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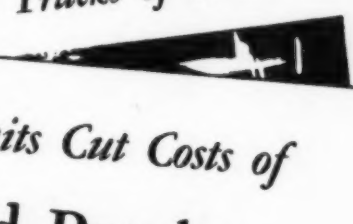


Portable Repair Units Cut Costs of

Asphalt Cold Patches

PUMPED CONCRETE

Cuts Cost of Floors and Roof of

Five-Story Albany Post Office

STIFF-LEG DERRICKS

Handle Materials for

How to Increase Efficiency at the

BATCHING PLANT

From a report by ANDREW P. ANDERSON Highway Engineer, Division of Materials

Planning and Planting

Medium-Sized Jobs

By J. B. BURGHARDT, Formerly Construction Superintendent for J. R. Hampson & Co., Inc.,

HOW

. . .

The reading pages show you "HOW"—

The advertising pages show you "WHAT WITH"—

— a service combination hard to beat.

. . .

See page 3 for "HOW" items in the editorial pages.

See pages 84 and 85 for "WHAT WITH" items made by manufacturers whose advertisements appear in this issue.

If you do not find what you are looking for —

Write

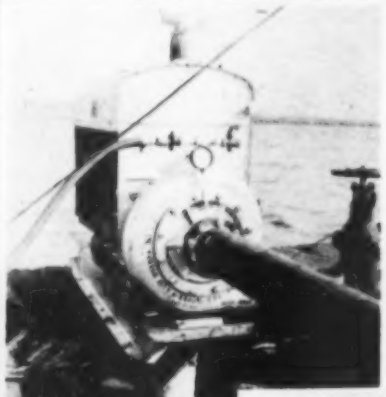
CONSTRUCTION METHODS

Information Bureau

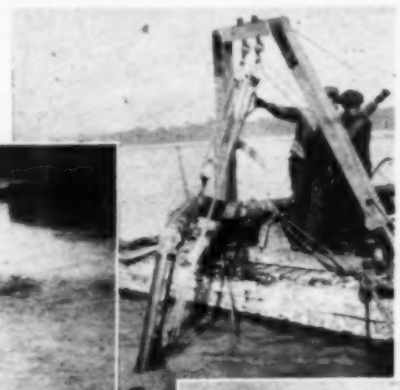
330 West 42nd St., New York City

DEPENDABLE CONSTRUCTION EQUIPMENT

Sterling dredge pumps, self priming centrifugal pumps, single and multi-stage jetting pumps — Universally recognized as the most simple, most dependable and most rugged equipment for use on any type of construction work.



Morrison-Glasscock-Conner Co. dredge channel in river near Blair, Nebraska using 6" Sterling direct connected dredge pump.



SIMPLE DEPENDABLE RUGGED

STERLING QUALITY

PUMPS
HOISTS
SAW RIGS
GENERATING PLANTS

Three Sterling dredging pumps are being used to deepen Sugar Lake. Operating continuously day and night these pumps are again proving the value of good equipment. These unretouched photographs show the compact design and tremendous capacities obtained with Sterling dredging pumps on these jobs.

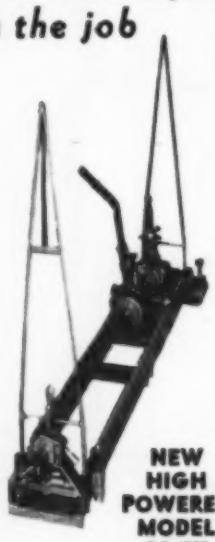
Sterling
MACHINERY CORPORATION
411-13 Southwest Blvd. Kansas City, Mo.

The secret of Sterling's success is very simple. It lies in building better equipment.

TRAFFIC *rolls along uninterrupted when* HYDRAUGER *is on the job*

The use of HYDRAUGER in laying pipe under pavements avoids traffic interruption and damage to pavements. It bores straight, quickly, and with least possible expense.

The latest type Model 2A-2X is easier to handle and much faster than previous models. It is driven by 5 h.p. airmotor—bores holes from 2½" to 14½"—has hi-tensile bar joints and easy-to-handle 4'-8" bar sections. Its new style cutters bore faster and straighter. The shorter frame facilitates setting up. Write for full details about the new 2A-2X.



NEW HIGH POWERED MODEL 2A-2X

HYDRAUGER CORP., Ltd.
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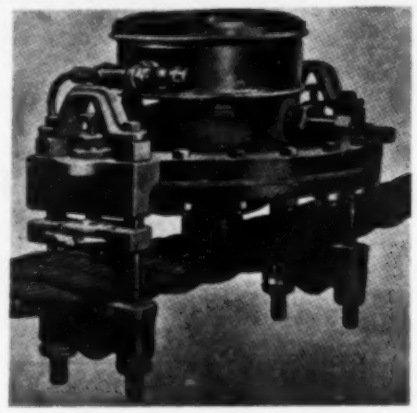
"The Mechanical Gopher"



How much does WIND, ICE *or* WATER *increase the strain on a line?*

These added strains on any cable can all be measured without deadending with the Martin-Decker Shunt Type Cable Tension Indicator.

Three sizes. *The standard* for wires or cables for ¼" to ¾", capacity 15,000 lbs.

***Heavy duty* for wires or cables from ¾" to 2¼", capacity 250,000 lbs.**

***The miniature* for lines and cables up to 3/16", capacity 200 lbs.**

All sizes are adjustable for temperature changes.

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3431 Cherry Avenue, Box 249, Long Beach, Cal.
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FOR UNMATCHED VALUE . . .
FOR GREATER PROFITS . . .

Light loads, medium loads, heavy loads —whatever your hauling needs may be, there's a GMC to fit and to challenge the field.

Take the medium duty range, for example. For 3 to 5 ton loads, there is an array of GMCs whose popularity is proved by registration figures alone. These big, rugged trucks have, first of all, the advanced streamlined styling that buyers have been quick to value. Powerful valve-in-head engines with their many quality features of design assure the performance and economy that are reflected in more trips, more work, greater profits. In fact, everything about these modern GMCs "shouts" engineered-for-the-job design and construction.

Then, too, the new all-steel "helmet-top" cabs, available for these and other trucks in the GMC line, match the chassis themselves in features that contribute to advanced styling, comfort, convenience and long life.

Words fall far short of doing full justice to the great GMC line. Inspection, comparison and test will prove far more.

GMC THE TRUCK OF VALUE

½ TO 15 TONS

GMC PRICES START AT $425
FOR THE ½-TON CHASSIS, F.O.B. PONTIAC

Time Payments available through our own Y.M.A.C. 6% plan

General Motors Trucks and Trailers

GENERAL MOTORS TRUCK COMPANY, PONTIAC, MICHIGAN

Engineering Construction's *expands sales opportunity*

Industrial Building Spurt Marks Current Activity in this field

F. E. SCHMITT
Editor
Engineering News-Record

Construction is setting the pace in the program of recovery of the heavy industries in 1936. Confirming the promise of the preceding year, the steady advance of construction assures the permanence of this recovery. Any doubt about the continuance of the upturn in construction activity that was the outstanding event of 1935 is dispelled by the present year's record, which shows that the rate of new building is not only maintained but month after month is further increased.

The first five months of the year registered a 40% gain in engineering construction over the corresponding months of 1935. *The big gain is in industrial rebuilding and expansion.* Dwelling-house construction is going forward at double last year's rate. Public Works, still holding up, should soon be back in second place, their normal position.

Period of Retrenchment is Over

Shortages and obsolescence have been accumulating everywhere during five years of retrenchment and marking time. Plant and equipment deteriorated, while new products and new requirements were evolved. Inevitably the time came when a large part of the old plant had to be rehabilitated or rebuilt if the nation was to continue in business. With confidence and courage returning, and money once more seeking new investment, these conditions have started fresh industrial growth, and with it have given the initial impulse to the work of rehousing.

It is significant that this revival is not a boom. The growth is steady. It moves ahead continuously. Devoid of speculative features, the movement is a healthy expression of faith in the future and willingness to venture and to invest. Because of this fact also, one by one all departments of the capital goods field are joining in the advance, from pumps to shovels, steel work to cement, power cables to air compressors and many mills and factories will be busy supplying them.

Since the greater part of the country's current savings is invested through construction, the present growth affects every industry, every business and every citizen. *It points the way to the return of busy times and prosperity that will be felt in terms of increased sales throughout all business and industry.*

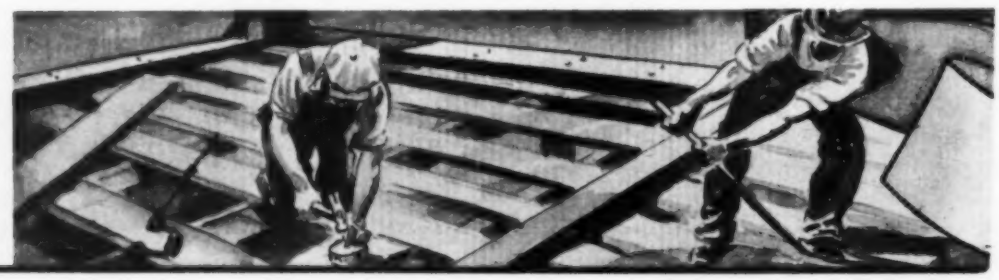
●

New Planning Policy Ousts Obsolete Equipment

R. K. TOMLIN
Editor
Construction Methods

Modern equipment and methods have expanded the scope of heavy construction to a point where it is now feasible to undertake projects which were only dreams a decade or two ago. In heavy construction today, the key to success — and profits — is *proper equipment for the job.* In contractors' language this means intelligent advance study of the project in terms of the construction operations involved and then the selection of the right amount and right kind of machinery to maintain a predetermined schedule of progress.

Construction by modern methods is more



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Remarkable Revival
in Industry's 12 Major Markets

a problem of organizing and coordinating machine operations than it is a management of men. It has been truly said that a "job well equipped is a profit half earned." Progressive contractors are fully aware of this principle and they realize, too, that in no other industry does obsolescence, rather than wear or age, more quickly outmode equipment than in the construction industry.

New Equipment has been Designed to Cut Construction Costs

Manufacturers have been active, particularly during the last three years, in designing new machines or making radical improvements in exisiting models. They have been cutting down on weights, using high-strength alloy steels and welded connections, increasing speed and flexibility, adding power and raising capacity by refinements in design and operating control. *To the contractor these developments are of vital significance for they mean his bread and butter — lower unit costs — even at the expense of scrapping equipment that might be considered serviceable if newer and better machines were not available.*

An experienced construction engineer has summed up the matter of adequate machinery in these words: "As a rule, the first cost of mechanical equipment for a project is a relatively small element of the total cost of doing the job. The day-to-day costs are what count and where these can be reduced by more expensive equipment, within reasonable limits, such opportunities must not be overlooked. If the machinery is right, the job is as good as built."

From every viewpoint, this attitude toward the purchase of construction equipment *not only makes this industry an active market in itself but helps also to speed the production of capital goods in other industries.*

Electrical Work Booms as Revival Spreads to Industrial Building Projects

S. B. Williams
Editor
Electrical Contracting

Significant of the sharp upturn in electrical construction activity is the shortage of skilled electricians developing in a number of cities. New commercial buildings, modernization of industrial plants and mercantile establishments have been the outstanding factors of improved business. Added to these, however, are several promotional programs which are actively stimulating additional wiring, including the rural electrification program. Eastern floods caused a tremendous damage to wiring, the replacement of which will take at least two or three years to accomplish.

The trend toward improved mechanization of industry is bringing more complicated power processes and more intricate systems of control. Air conditioning, higher lighting intensities and automatic regulation of power, light and heat are only just beginning to grow. Add to this a promotion program for more adequately designed wiring installations, and *it becomes apparent that the electrical portion of the building dollar is bound to become much larger.*

The rewiring market which amounts to several billions of dollars in itself represents a tremendous opportunity for the sale of materials and supplies. Thus with a three-fold opportunity in modernization, new construction and rewiring markets, electrical construction offers one of the largest sales potentials in the country for increased consumption of manufactured products.

NATIONWIDE expansion of construction activity is reflected in increasing orders in every one of Industry's 12 Major Markets. For the construction boom which began with public works projects has been paralleled by a sharp upswing in industrial construction and rehabilitation. From these twin sources all industry is benefiting with increased orders for materials and equipment. Those who sell machines, methods or materials that cut costs, increase output or expand profits face greater sales opportunities than ever before.

* * *

Mass production cuts industry's manufacturing costs. Advertising — the mass production sales tool—cuts industry's selling costs. For advertising in the right publications sees and sells all the worthwhile buyers in each field. Let a McGraw-Hill representative bring you a picture of the immediate sales and advertising opportunities in your best markets. Let him demonstrate how a strong schedule in these key publications will convert today's sales opportunities into tomorrow's signed orders.

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THE MONEY IS AVAILABLE

Let's Rebuild America

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EQUIPMENT and MATERIALS

An index of products made by manufacturers whose advertisements appear in this issue of Construction Methods.

If you do not find all you need in the advertising section, we shall be glad to assist you. Write to —

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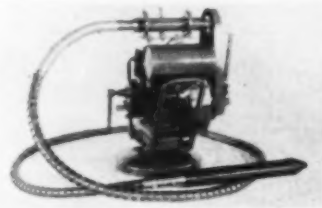

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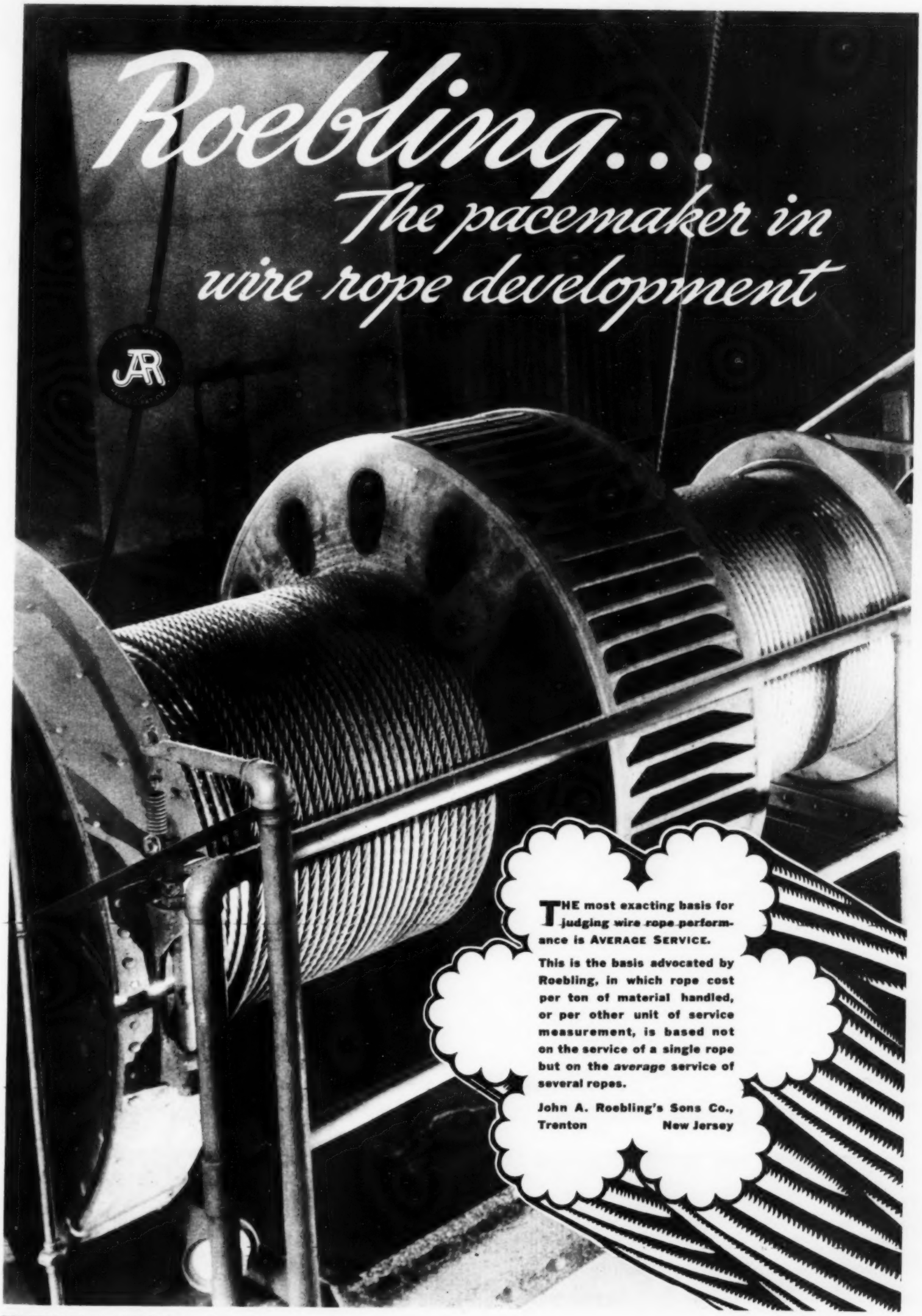

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